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# A Study to Determine the Impact of Team Teaching on Pupil Achievement in a Fourth Grade Classroom

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A STUDY TO DETERMINE THE IMPACT OF TEAM TEACHING  
ON PUPIL ACHIEVEMENT IN A FOURTH GRADE CLASSROOM

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A Thesis

Presented to  
the Graduate Faculty  
Central Washington State College

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Education

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by

Morag M. Liboky

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## CHAPTER I

### THE PROBLEM AND DEFINITIONS OF TERMS USED

The organization of any given school is really a framework which is designed to facilitate achievement of educational goals. Educators faced with the task of organizing schools must address themselves to two types of organization, namely: vertical organization and horizontal organization.

Vertical organization provides a system for classifying students and moving them upward through a school program, while horizontal organization provides a system for dividing a given student population into instructional groups and allocating them to teachers. This study is concerned with one type of horizontal organization--team teaching.

#### I. THE PROBLEM

Statement of the problem. This study is undertaken in order to determine whether fourth grade children, taught in a school horizontally organized for team teaching, will achieve as well as, or better than, fourth grade children taught in a school horizontally organized on a self-contained classroom basis.

Importance of the study. When a new form of organization for instruction is introduced in education it usually attracts widespread interest and attention. This is true of team teaching. The National Committee Project on Instruction reports:

The organization of elementary school team teaching programs in public schools increased from 5 per cent in 1955-56 to 15 per cent in 1960-61. It is estimated that team teaching will be in use in elementary schools in 30 per cent of the country's school districts by 1965-66. . . . (28:18)

Team teaching as a type of horizontal organization was initiated in the Cashmere, Washington, public schools in the spring of 1963. The staff of the Vale Elementary School and their third and fourth grade pupils moved into a specially designed building in late April of that year. The group had approximately a six week experience before the close of the school year. A full fledged effort at team teaching got under way in the fall of 1963.

The patrons of the Cashmere schools had been involved in the planning for the organizational change from a self-contained classroom type of program to a team teaching program since late 1961. Hence, a considerable amount of time would elapse between 1961 and 1964. Because of this time element, the patrons needed some assurance that their children were achieving at least as well as pupils in the conventional self-contained classroom. It is hoped that

through this study the community will have concrete evidence of pupil achievement.

A second reason why this study is important concerns the possible utilization of the results by other school districts anticipating changes, or in the process of changing their horizontal organization. Since the Cashmere program is one of the first in the Pacific Northwest and one of very few in the nation to involve children in the eight to ten year old age group, the results may well be scrutinized with care by many educators.

Finally the study will serve to lay the groundwork for a long term study of the Cashmere team teaching program.

## II. DEFINITIONS OF TERMS USED

Since there are so many approaches to the team teaching technique throughout the United States, the definitions used in this study will be the ones existing in the current literature.

Experimental School. The experimental school is Vale Elementary School in Cashmere, Washington, where team teaching is currently being carried on in grades three and four.

The fourth grade pupils will receive instruction in a team teaching setting and will be referred to in this study as the experimental group.

Control School. The control school is located in a nearby community of similar socio-economic level.

The fourth grade pupils will receive instruction in the self-contained classroom and, hereafter, shall be designated as the control group.

Team Teaching. Team teaching is a form of staff or instructional organization in which a group of teachers are jointly responsible for planning, carrying out, and evaluating an educational program for a group of children with each teacher having some degree of responsibility for instruction in all subjects. Team teaching is an effort to improve instruction by a formal program of reorganization of personnel in teaching in which two or more teachers take charge of planning lessons, developing appropriate methods and materials, teaching and evaluating the program of studies for a significant part of the instruction of the same group of students.

Associate Team. A team comprised of all the teachers of a designated grade level joining together as colleagues for the instruction of a group of students. In this arrangement there is no designated team leader and planning, instruction, and evaluation are worked out cooperatively.

Teams in this classification may include non-professional adults or students who assist in non-teaching functions.

Teacher Aide. A person, usually non-professional, who works with the team on a paid part-time basis, relieving the teachers of clerical and other routine work so that they may concentrate on instructional activities. The aide has no direct relationship to the attainment of any given educational goals. The aide would be responsible for such routine tasks as record keeping, duplicating, setting up audio-visual equipment, grading objective tests, and doing research and background work for the teaching team.

Large Group Instruction. Instruction designed for a group of fifty to one hundred students in order that they may receive knowledge that is common to every student and to provide the opportunity for the most talented and specialized teachers to influence a larger number of students. Instruction and discussions will be conducted by teachers who are particularly competent, who have more adequate time to prepare, and who will utilize the best possible instructional aids.

Regular Class Instruction. Instruction designed for classes of twenty-five to thirty pupils in which one teacher is responsible for all instruction.

Small Group Instruction. Instruction designed for a group of six to fifteen pupils grouped by ability, need, strengths, and/or interests.

Individual Instruction. Instruction designed to fit the needs of an individual child.

Team Planning Session. A period devoted to planning at which all members of a team are present and specific instructional assignments are decided upon. An attempt is made to take into account each student's progress and learning needs in each curricular area and in relation to different learning goals within that area.

Guidelines. A series of statements prepared for the purpose of guiding the preparation and presentation of learning experiences.

Self-Contained Classroom. A room in which a single teacher takes full responsibility for all the activities of a group of children throughout the day. The teacher is expected to have the skills and knowledge for competent instruction in virtually all subject matter areas. The teacher must provide as best as possible for the range of individual needs and abilities in her group.

Matched Pairs. In order to reduce the effect of external differences, two groups of children were matched individual by individual according to three variables; Iowa Tests of Basic Skills percentile scores, chronological age, and sex. They are so paired in order that statistical results can be computed.

### III. LIMITATIONS OF THE STUDY

This study of necessity has limitations. It is limited to a comparison of fourth grade pupils only and the number of students involved in the study limits the value.

The number of matched pairs was determined by the size of the fourth grade classes. Matching could only be done in three areas as current information was not available for all children on such items as IQ scores and socio-economic level.

Form 1 of the Iowa Tests of Basic Skills was the only battery of achievement tests that had been administered to the fourth grade pupils in both schools in the fall of 1963. This achievement test, used as a source of data in this investigation, was not administered by the same person in both schools in the fall. The county school psychologist administered the test to the experimental group by means of large group instruction. The classroom teachers administered the test to the control group in their own classrooms.

Form 2 of this test was administered to the matched pairs by the writer during the first week of May.

Such unmeasurable factors as personal experiences, home background, over-all health and emotional stability of the children could have affected the outcome.

## CHAPTER II

### REVIEW OF LITERATURE AND RELATED RESEARCH

Francis Keppel (27:21), current United States Commissioner of Education, has been quoted as saying, "The temper of the times seems to be right for experimentation and innovations in education."

The search to improve the quality of education has led educators to develop new methods of organization for instructional purposes.

There are numerous pilot studies and experimental projects being carried out today, one of which, team teaching, is currently attracting widespread interest.

#### I. BACKGROUND OF TEAM TEACHING

Shaplin brings up the following points in a discussion of team teaching:

. . . In an explosive era of American education, team teaching has been merely one element in a broad pattern of innovations and changes, all aimed at improving the quality of instruction. In this pattern, certain major directions are clear: a search for ways to create for teachers attractive new positions with greater status, rewards, and responsibility; a search for ways to improve the utilization of the present teaching staff and facilities; a search for ways to revise the school curriculum in almost all areas; a search for ways to create smaller human organizations within the large-size structures which have become characteristic of our schools; a search for ways to change existing school organization to provide for more efficient instruction in certain areas and



for continuous pupil progress in others; and a search for ways to apply technological innovations in instruction in schools. . . . (30:54-55)

Team teaching is basically a method of organizing groups of students for instruction so they will receive the benefit of instruction from the most capable teacher in a particular field and will receive the benefit of increased intellectual stimulation by contact with several personalities.

Judson Shaplin (30:1) states, "Team teaching . . . has rapidly assumed the dimensions of a major educational movement. . . ."

Team teaching, with regrouping and large-group lectures, originated several years ago as an idea in the mind of Francis Keppel, then Dean of the Harvard Graduate School of Education.

A small group of faculty members in the Harvard Graduate School of Education considered some extremely tentative proposals for school reorganization that had been suggested by Dean Keppel. The faculty members found that the proposals brought out some exciting theoretical concepts and a proposed new structure of school organization. The faculty group further developed and refined Dean Keppel's proposals to the point of considering plans for testing the new arrangements.

Early in 1957, the Fund for the Advancement of Education invited Harvard to work with three nearby public school systems to develop new techniques in education.

Harvard agreed, and with a generous grant from the Fund, established the School and University Program for Research and Development. Known as SUPRAD, this organization joined the school systems of Concord, Lexington, and Newton, Massachusetts, with Harvard's Graduate School of Education.

Dean Keppel then organized and outlined the structure of the teaching teams as they were later to be formed at Franklin School.

Perhaps the best known of all team teaching projects is the one begun at Franklin School in Lexington, Massachusetts, in 1957-1958. It was probably the first example of an entire school being organized into teams.

Team teaching started with a few pilot projects in 1956 and 1957 and the movement has now spread to several hundred communities throughout the country and plans now under development suggest increasingly rapid growth.

In the forward of the book, Team Teaching, Francis Keppel makes the following statements:

. . . the national commitment to exploring the possibilities of new ways of organizing schools is already substantial. Because of its actual and potential relationship to other reform movements in education, it is possible that team teaching will stand the test of the time rather than slide into the footnotes of educational history. James B. Conant, who is not easily

swayed by current fashion in education; has written the following about elementary education: (30:ix)

"There is without a doubt a ferment among educators with respect to the conduct of elementary education. The long-standing notion of a self-contained classroom of 30 pupils taught by one teacher is giving way to alternative proposals. One of these proposals is team teaching, which, as we have seen, has advantages in orienting new teachers.

"If the idea of team teaching becomes widely accepted-- and many elementary school principals predict that it will--there will be places in classrooms for a wide range of instructional talent. How such schemes will work out over the years in practice remains to be seen, but team teaching seems to many the answer to the question of how to attract more of the ablest college students into elementary school teaching. The possibility of a teacher's having an opportunity to take advantage of her special field of interest is exciting" (30:ix).

There is no doubt that the concept of team teaching is a stimulating one. Team teaching exists in many forms and for a variety of reasons and it is evident that there is considerable flexibility in most team teaching arrangements. Each school system has its own specific reasons for undertaking team teaching and each must work out a unique solution for its own best interest. Arnold states:

The team idea has distinct possibilities as a very effective means of meeting some of the problems facing schools today, but the basic purpose should be clearly defined and thoroughly understood before a school launches such a program. To rush into it without thorough preparation, particularly of the teachers involved, is to invite chaos. Team teaching is a means designed to attain certain goals, and these goals must be understood and accepted by those involved. (6:20)

A variety of reasons are cited for developing new staff organization plans such as team teaching. Discovering

and demonstrating new and more effective ways of utilizing teacher competencies is an objective common to many team projects. Other schools are attempting to improve the quality of instruction by the team approach. Team teaching has been offered as a means of establishing a hierarchy of roles in teaching and thereby providing more attractive career opportunities for superior teachers.

In the present system of elementary school organization the typical teacher has little opportunity for professional growth. Every teacher is given the same number of pupils, the same time schedule and curriculum, and the same responsibility. Her strengths and her creativeness are limited to one class as are her inabilities and weaknesses. She seldom, if ever, observes a superior teacher in action, her contacts with other teachers are limited, and part of her day is spent on nonprofessional clerical chores and supervisory duties.

Although there are differences in ability, each teacher is paid essentially the same salary and the only way a gifted teacher can improve her status is by taking an administrative position in which she loses her direct daily contact with students.

Many efforts are presently being made to revise this situation. One of the most promising lies in the organization of teaching teams.

## II. ADVANTAGES OF TEAM TEACHING

In reviewing the literature concerned with team teaching one finds many possible advantages mentioned. Some of the major advantages will be discussed in this study.

In speaking of the organization of teaching teams at Franklin School in Lexington, Massachusetts, R. H. Anderson states:

Implicit in all efforts to create more attractive conditions (economic, social and professional) for teachers was the belief that these would lead to better instruction for children, through more effective performance of the teachers. It was hoped that the team organization would permit more flexible and appropriate grouping arrangements to meet individual interests. It was believed that children would be stimulated by association with larger numbers of children and with more than one teacher. It was expected that teachers would find more efficient and interesting ways of presenting lessons through having larger blocks of planning time and through doing more group planning. It was thought that the pooling of teachers' ideas and observations would lead not only to stronger teaching but to better pupil adjustment and more adequate pupil guidance. . . . (4:72-73)

Working as a team, teachers take joint responsibility for instruction and it is possible to pool the strengths of several teachers and coordinate these strengths in a better instructional program. Teachers are able to develop further specialization in areas of special interest to them.

Teachers on a team must be willing to share responsibility and willing to step aside at times when another team member has greater competence in a given area.

Teachers are provided with time to plan cooperatively, exchange ideas, analyze situations and evaluate their program. Hoopes points out:

One of the unique features of team teaching is that teachers can plan together, see each other teach, talk together, analyze what happened, and profit from this exchange. Teachers are brought into a close relationship as they share the responsibility for teaching the same group of students; consequently, the teacher must learn to work cooperatively with other teachers. (20:177)

Team teaching in the elementary school makes it possible to divide students into different ability groups for each separate subject and to develop more flexible groupings that can change as children's needs change.

Extensive exploration of a wide variety of criteria for combining students, so that each student may obtain maximum benefit from instruction may be possible in a team teaching program. Arthur Morse states:

Ability grouping in a conventional elementary school divides youngsters into gifted, average or slow home-room units and assumes that this pattern holds true in all subjects. Team teaching recognizes that ability in language arts may not insure equal ability in number concepts. At the Franklin School [Lexington, Mass.] children and their parents are not as conscious of an ability "niche" because the students find themselves in different company in each class. (27:14-15)

Another possible advantage of team teaching is stated by Judson Shaplin:

Team teaching also provides a way of organizing for the improvement of supervision in the schools. . . . Within teaching teams it becomes possible to assign greater responsibility for the curriculum and for the supervision of other teachers to those teachers who are

more knowledgeable, more expert, and more willing and able to accept leadership. . . . (30:19)

Team members, not just administrators, make decisions concerning the team teaching instructional program on the basis of their joint observations and evaluations.

Team teaching is believed to be ideal for training student teachers and beginning teachers. The young teacher has more intimate contacts with experienced teachers and has a continuous opportunity to work with several experienced teachers.

Clerical and secretarial needs are cared for by clerical aides. The aides help with such routine non-instructional tasks as record keeping, grading objective tests, supervising and administering tests and making ditto masters thus freeing the teacher to plan or to work with children.

Large group instruction is organized to present structured learning experiences to every student. This may be a lecture, a guest speaker or the use of audio-visual materials. Many activities such as these can be supervised by one teacher releasing other members of the team to plan.

By taking advantage of opportunities provided through the presence of specialists and clerical aides, and taking advantage of released time provided through scheduling of large group lessons and through creation of fewer groups

than teachers, much more effective use of professional personnel can be realized under team organization than under the self-contained pattern.

Shaplin summarizes some current needs in education which possibly justify team teaching:

. . . What is needed within teaching is a method of suborganization, a grouping of teachers into small groups with common work objectives and shared working space, to which the teaching aides and clerical assistants can be attached in such a way that a sufficient amount of work will be absorbed efficiently from the teachers to allow a reduction in the teaching force. One of the principal justifications for team teaching may be that it answers this need. (30:77)

Team teaching is not something that can be done easily. It requires thorough preparation, planning, coordination, and dedicated cooperation.

### III. CONTRASTING PRINCIPLES UNDERLYING TWO THEORIES OF CLASS GROUPINGS

Team teaching may be better understood against the background of the more common organizational pattern of the self-contained classroom.

A further explanation of the two theories of class groupings is presented in order to more clearly show distinction between the two.



Team Teaching Approach

1. Groups of teachers take joint responsibility for instruction of a segment of the school population.
2. Three to eight certified teachers are responsible for 75 to 250 pupils of similar age and grade.
3. Clerical and secretarial needs are cared for by a clerical aide.
4. A senior teacher or team leader assumes responsibility for instructional leadership.
5. There is more flexible grouping as children are divided into different ability or interest groups for separate subjects.
6. Teachers develop further specialization in areas of special interest. Instruction is conducted by the most qualified and competent teacher in each curricular area.
7. Teachers plan cooperatively, exchange ideas, analyze situations, and evaluate their instructional program together.

Self-Contained Approach

1. Most instruction takes place at the hands of one teacher.
2. 20 to 30 pupils are assigned to one teacher.
3. The teacher performs clerical duties and supervisory tasks of a non-instructional nature.
4. Each teacher has the same responsibility, regardless of his or her special training, experience, skill or capacity for taking responsibility.
5. The teacher must provide as best she can for the range of individual needs and abilities in her group.
6. The teacher is expected to have the skills and knowledge for competent instruction in virtually all subject-matter areas.
7. The teacher has little contact with other staff members or time to exchange professional views or discuss curricular areas.

Team Teaching ApproachSelf-Contained Approach

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|--|--|
| <p>8. Students are subjected to a variety of teachers, many of whom are superior teachers.</p> <p>9. Evaluation may be a joint responsibility of several teachers. Comparison and discussion will lead to grading.</p> <p>10. Teachers have released time to plan their instructional program.</p> | <p>8. The quality of the education of a student is dependent upon the competence of a single teacher.</p> <p>9. One teacher is responsible for the evaluation of a pupil's work in all areas.</p> <p>10. All planning is done by the one teacher in her free time.</p> |
|--|--|

## IV. ORGANIZATIONAL PATTERNS OF TEACHING TEAMS

Organizational patterns of team teaching differ greatly as Heathers points out:

Team teaching can refer simply to injecting the theme of teamwork into the conduct of instruction, or it can refer to an approach to organizing the total instructional program. It is not clear at present whether the school of the future will be described as having a team teaching plan of organization, or whether it will be described as employing the theme of teacher teamwork within an organizational plan that bears some other name. What seems clear is that team teaching is one of the foremost themes of the educational reform movement and, unless present trends change sharply, will hold a prominent place in the new education that is taking shape. . . . (30:371-372)

There is no standard pattern for teaching teams. No perfect models capable of common application have as yet been developed.

Brownell and Taylor have proposed a series of six theoretical team teaching models for use in the elementary

school. However, in regard to those models they make the following statement:

We recommend closer analysis of assumptions, more explicit models, better research design, and more penetrating evaluation of results of team experimentation so that schoolmen will be able to make sound judgments about teaching teams. (10:157)

The full potentiality of this type of organization is yet to be realized. Shaplin writes:

When comparing different team teaching projects, one is impressed by their great diversity in both methods of organization and aims. Their common properties are difficult to identify, both because each program tends to define itself in very general and, at the same time, exclusive terms and because no clearly recognizable group of projects seems to have the same objectives. . . . (30:5)

Cunningham emphasises the need for careful labeling of organizational plans:

There has been noted a tendency for school administrators to label as team teaching almost all cooperative ventures on the part of members of their staff. The temptation to so name these efforts is difficult to resist in light of the significance that is currently being attached to this way of organizing for instruction. Some of the informal associations among teachers really do not deserve to be called teaching teams. . . . (15:7)

Cunningham believes that if a "team" does not include at least these things in its performance, the relationship among teachers does not deserve to be called a teaching team:

. . . (1) examine together the goals and objectives of their subject; (2) share joint responsibility for the instruction of a group of youngsters; (3) spend a major part of their planning time in cooperative planning; (4) assume responsibility for criticizing team members' performances; (5) develop evaluation techniques and devices together; (6) criticize their subject or

discipline with a view toward making it more meaningful and useful to students; and (7) bring the total resources of the team to bear upon the growth of each individual enrolled in team taught classes. . . . (15:7)

In speaking of the diversity of interpretation in team teaching, Shaplin lists these areas that may be described as common, but not exclusive characteristics of team teaching:

. . . four directions which some teaching teams have taken are worthy of particular attention: the development of further specialization in teaching, the improvement of supervisory arrangements in teaching, the utilization of nonprofessional aides for teachers, and the expanded use of mechanical aids to teaching. . . . (30:18)

## V. RELATED RESEARCH IN TEAM TEACHING

Very few definite statements as to the results of team teaching were found; therefore, the writer has tried to point out the need for further studies and continuing research on the effect of team teaching on education.

Many research studies of team teaching are presently being carried out throughout the country.

Currently Harvard is conducting an extensive study of team teaching and substantial amounts of evaluation materials are available on the Lexington Team Teaching Program since it has been in operation since 1957. Harvard research workers from SUPRAD work alongside the team personnel under the direction of a committee of school and

university representatives at Lexington, Massachusetts, to direct and evaluate the team teaching experiment.

R. H. Anderson, SUPRAD's project director for the Franklin School experiment, explains evaluation at Lexington in the following statements:

. . . Evaluation will necessarily be a long-term problem because results obtained during the developmental stage are less directly attributable to team teaching than they will be when a certain stability is achieved. (3:64)

It is too early to evaluate the project, although subjective evidence from pupils, parents and professional participants is definitely encouraging. . . . (3:65)

The research of the Norwalk Plan in Norwalk, Connecticut, is quite similar to that of the Franklin School Project, and the results of the first year of operation revealed satisfactory pupil progress and general enthusiasm among participating adults, including the parents (3:102).

A new two-year project is being conducted by the National Education Association's Department of Classroom Teachers. The project, "Time To Teach," was authorized in the summer of 1963 with Malcolm M. Provus as director (26:2). "Time To Teach" is aimed primarily at documenting methods of more efficient use of teacher time. The project will aim at improving the quality of instruction through more efficient use of the teachers' time, energies, and skills.

Consideration in the "Time To Teach" project will also be given to such matters as class size, staff-pupil ratio, utilization of audio-visual and programmed learning materials, and the role of the non-professional assistants in the schools.

To date, almost all of the research on team teaching has been focused on its evaluation. More and better research is needed to resolve the conflicting claims of team teaching as much of the available data is incomplete.

At present most of the concern is that team teaching does at least as well as conventional plans with respect to the learning outcomes measured by standardized tests.

In reporting on academic achievement, Bair and Woodward state:

The limitations of standardized tests are well known, but team teaching programs do not hesitate to use them as one of several devices in seeking to analyze a program which attempts to make it possible for each child to reach the "limit of his ability." . . . it seems unreasonable to expect dramatic improvement in the early stages of such a program. Nevertheless, it is critical that, at an early stage, a team teaching program be able to demonstrate clearly and honestly that pupils do at least as well as they would in a conventional program. In general, such evidence has been produced by most team teaching projects. (7:197)

It is true that a great many valuable findings of current research projects have not yet been published. It is evident that it takes a school system several years to develop a team teaching program to the point where its potential outcomes can be realized.

Research on team teaching has scarcely moved beyond the state of preliminary exploration. Doubtless the volume of published research will increase rapidly during the next few years as reports on a number of major projects reach publication.

Anderson has found that data reported to date show that team teaching results are no less satisfactory than those from typical conventional teaching in elementary and secondary schools (2:54).

The conclusions Drummond (30:326) reached in 1961 still hold true: "Students do as well or perhaps a little better on standardized tests when taught by teaching teams of the various types described." Drummond points out that differences found between team teaching and a conventional plan of organization usually are not statistically significant (30:326).

Heathers reported these results of the Norwalk Plan:

In a report on the third year of the Norwalk Plan (1960-1961), achievement-test results are evaluated with the use of control groups. Control groups were set up by the matched-pairs technique on the basis of grade level and IQ. No consistent superiority was found for either team teaching or the self-contained classroom. . . . Few of the comparisons yielded statistically significant differences. . . . (30:328)

In statements from the SUPRAD research and development staff concerning the May, 1963, results of achievement tests in the Lexington Team Teaching Program, they report:

The academic record of the team teaching schools, as measured by achievement tests, is excellent and has shown a steady improvement each year for the past four years. These results cover a sufficient period of time to give assurance that the pupils are making above average progress. (7:207)

Only a few reports on team teaching show specific findings, and details about research methods are not complete. Most of the reviews of research list only the major findings without evaluating or explaining the research methods employed.

The need for further research studies in team teaching in areas other than achievement on standardized tests is pointed out by Cunningham:

. . . Many of the "experiments" with team teaching have not included control groups for comparative purposes. Also, there may be substantial pupil gains which are not assessed when conventional measurements are used. For example, a student's growth in such things as his capacity to solve problems, to lead classmates, to contribute to group activity, or to inquire independently, may be greater with effective team teaching. . . . (15:8)

In a review of studies of team teaching as reported in publications, Heathers makes the following statement concerning further research needs:

Data on student achievement are limited to what is measured by standardized achievement tests. Such tests stress tool skills, vocabulary, and information, and slight or ignore numerous important learning outcomes. . . . In consequence, the research reports give no evidence on whether or not team teaching produces gains with respect to learning critical thinking, creativity, competencies in inquiry, or self-instruction. (30:329)



This chapter of review has been more a survey of research needs than one of research findings.

Team teaching plans have not yet been developed and implemented to a point where one can even estimate their potential contributions to education.

Heathers further substantiates the need for continuing development and research in team teaching:

. . . New plans for team teaching will continue to appear, new methods of implementing teamwork will be developed, and new findings will be forthcoming from research evaluations. Policy makers who are interested in team teaching will, each succeeding year, have a sounder basis for making judgments about the advantages and disadvantages of this sort of organizational plan. It is important for them to recognize that team teaching is still in its pilot phase and that they should not expect more than tentative evidence as to its effectiveness at this time. (30:374)

## CHAPTER III

### RESEARCH DESIGN

The principal purpose of this study was to determine the impact of team teaching on the achievement of fourth grade pupils as compared to fourth grade pupils taught in a self-contained classroom.

In order to accomplish this and to reduce the effect of external differences it was necessary to set up an experimental group and a control group from which pairs were matched for comparison purposes.

#### I. ADMINISTRATIVE CONTACT AND APPROVAL

This research study would not have been possible without the knowledge, approval, and assistance of the administrative personnel of the two school systems involved.

The initial administrative contacts were the superintendent and elementary principal of Cashmere School District No. 122 who explained their needs and approved the plans for the study.

The superintendent of the school district in which the control school was located and the principal of the control school were then contacted and met with the Cashmere administrators and the investigator. Approval of the plans

and consent to carry on the testing and investigation was granted.

The fourth grade teachers in both schools expressed their willingness to cooperate in the study.

## II. EXPERIMENTAL GROUP

Experimental group. Vale Elementary School in Cashmere, Washington, is designated as the experimental school in this study. The team teaching form of horizontal organization has been in progress at Vale School since the fall of 1963.

This team teaching project involves two associate teams composed of four teachers from the third grade and four teachers from the fourth grade. Additional personnel including the instructional materials coordinator, a vocal music teacher, an instrumental music teacher, and student teachers from Central Washington State College serve the team in a complementary manner. Only the fourth grade team and pupils will be considered as the experimental group.

One of the unique aspects of the Vale School program is that the building and instructional program were planned simultaneously. The school building is octagonal. Eight classrooms are clustered around one large circular-shaped instructional resource center. Each classroom is divided from the center by its own door and by sliding glass windows.

All classrooms are visible from any point in the instructional center. A diagram of Vale Elementary School may be found in Appendix A.

The instructional center contains vertical files, storage space for textbooks, a papercutter, a duplicating machine, typewriters, a worktable for teachers, carrels for students, library tables and chairs, and portable bookshelves with library books, reference materials, trade books and magazines.

The following audio-visual aids are available in the instructional resource center: two overhead projectors, a filmstrip and slide projector, a tape recorder and ear-phones, a record player, a film projector with rear-projection technique, an opaque projector, portable bulletin boards, and a transistorized public-address amplifier.

All the furniture in the building is portable and all walls but two are operable and can be rolled back to permit a quick conversion from a normal sized classroom to areas for large group instruction. All classrooms have a minimum of window space, are carpeted, air-conditioned, lighted indirectly, heated radiantly and have their own exits both to the outside and to the instructional resource center.

Throughout the day children and furniture move about quickly and quietly as directed. Groups change in composition and size as the teaching program dictates.

Four basic types of instructional situations are used in this team teaching program, namely; (1) regular class-size instruction of twenty-five to thirty pupils similar to the self-contained classroom. This instruction is coordinated with large group instruction. (2) Small group instruction involving under fifteen pupils is utilized. Here use is made of the tape recorder and earphones, pictures, bulletin boards, and group discussions. (3) Large group instruction consisting of fifty to one hundred pupils is used when topics lend themselves to large group presentation. The illustrated "teacher talk" is used with such aids as films, filmstrips, and overlays and transparencies for the overhead projector. Resource people are utilized for large group instruction, as is the Standard School Broadcast. (4) Individual instruction or tutorial instruction is available for each pupil where use can be made of teaching machines, programmed materials, assigned individual projects, workbooks, and remedial materials.

During the period of transition from a regular program to a full team teaching program, attention is focused on selected areas of the curriculum. Reading, social studies, music, and library instruction were selected as the areas to be taught by the entire team. Other curricular areas, at present, are to be handled in the conventional manner.

In this associate team program there is no specified team leader. The teachers assume this position for a week at a time for planning purposes and there are no salary differences in this program.

This approach to teaching requires detailed team planning. Two team planning sessions are scheduled each week which are devoted to lesson planning and the preparation of instructional materials. The two planning periods are acquired when the vocal music teacher teaches a section of fifty fourth grade pupils while at the same time, the instructional materials coordinator is teaching a similar sized group in library skills. At the end of the period these two teachers switch groups and this interchanging frees the entire fourth grade team for planning.

Individual teachers gain additional planning time when one member of the team is in charge of large group instruction thus freeing the others to plan.

The children are regrouped a number of times each day enabling the staff to respond to the varying needs of the children with more flexibility.

The main team effort is in the area of social studies. As needs arise in social studies the children break up into various groupings for instructional purposes. Some individual work is also done in each unit of social studies.

Large group instruction is assigned to the most competent teacher in a given area or to one who has special interest in the area.

Extensive use is made of audio-visual equipment and materials especially in large group instruction. Teachers prepare their own audio-visual materials for bulletin boards and the overhead and opaque projectors.

The Joplin Plan of reading has been modified for use in this team teaching program. Each fourth grade teacher is responsible for a homogeneous group of children for reading. A child works in one of the four ability groups until his needs change and he is ready to move to another group. Homogeneous groupings are also used by the team in spelling.

Specialists, serving the team in a complementary manner, teach the vocal music, instrumental music, and library instruction. All other instruction is handled by the team members.

### III. CONTROL GROUP

Control group. The control school is located in a nearby apple-producing community and is of similar socioeconomic level and size.

The children in the control group were chosen from two fourth grade classrooms and were matched with pupils

in the experimental group. These fourth grade pupils included in the matched pairs are designated throughout this study as the control group.

The control school is horizontally organized on a self-contained classroom basis. Each fourth grade teacher does her own planning and follows the outlined course of study for the district. These teachers do not combine groups for any subject matter areas and music is the only area where a specialist comes into the classroom. Library instruction is handled by the classroom teacher. There is no clerical aide available to these teachers and they have no released time for planning.

Instruction is carried out in the self-contained manner with emphasis on group work, individual projects, and committee work. The social studies units covered by the control group are nearly identical to those used in the experimental group. However, the control group has been using the Science Research Associates reading program and the School Mathematic Study Group accelerated arithmetic program this year.

The control school is well equipped with a variety of audio-visual equipment and supplies. Overhead projectors, a film projector with rear-projection technique, slide and filmstrip projectors and tape recorders are used with the



control group. The equipment in the control school is quite comparable to the equipment in the experimental school.

The work area is also comparable to that of the experimental school. It is well equipped with typewriters, a duplicating machine, a Thermo-Fax machine, paper cutters, and all necessary supplies. Here the teachers prepare their own instructional materials for use in their classrooms.

#### IV. INSTRUMENT TO BE USED

The two schools involved in this study had administered the Iowa Tests of Basic Skills--Form 1 during the two week period beginning September 30, 1963, to all fourth grade pupils. The decision was made by the investigator to utilize said test in this study. Form 2 of the test would be administered in May by the investigator.

The Iowa Tests of Basic Skills consist of eleven separate tests for Grades 3-9. All tests for all grades are contained in a single booklet. Each pupil takes only items appropriate, in content and difficulty, to his own grade level. A separate answer sheet is provided for each grade level.

The tests provide for comprehensive measurement of the following fundamental areas: vocabulary, reading, the mechanics of correct writing, methods of study, and arithmetic.

The primary purpose of the tests is to reveal how well each pupil has mastered the basic skills.

#### FIRST TEST

During the two week period beginning September 30, 1963, Form 1 of the Iowa Tests of Basic Skills was given to all the fourth grade children involved in this study.

At Vale Elementary School the tests were administered by the county school psychologist by means of large group instruction and were hand scored by the teachers.

At the control school the tests were given by the classroom teacher in her respective classroom and the scoring was done by the classroom teachers.

#### RE-TESTING

Preparatory to the administration of the second series of tests was the formulation of a testing schedule. A schedule was drawn up and approved by both teachers and principals. This schedule appears in Appendix B.

During the first week in May, 1964, Form 2 of the Iowa Tests of Basic Skills was administered to the matched pairs involved in this study. The tests were administered by the investigator in a large group situation in each building with teachers serving as monitors.

All tests were administered in their entirety in strict compliance with the procedures laid down in the Examiner's Manual and the scoring and recording of the scores was done by the investigator.

The raw scores of Form 2 were submitted to statistical analysis, the results being reported in Chapter IV. Only results for the students in the matched pairs who were present for both forms of the test were included in the computations.

#### V. MATCHED PAIR APPROACH

Method of collecting data. The necessary data for matching was collected by the investigator from each pupil's permanent record. This data consisted of the pupil's name, chronological age, IQ, and complete scores from Form 1 of the Iowa Tests of Basic Skills, including grade equivalent scores and percentile ranks.

In the process of matching it was found that the IQ scores could be of no use as they had not been derived from the same test nor had they been given the same year.

The small number of fourth grade pupils involved made it impossible to match socio-economic conditions. However, the two schools involved are of similar socio-economic levels.

The pupils were then paired by sex, chronological age, and percentile rank on the Iowa Tests of Basic Skills.

The pairs were chosen from 63 fourth grade pupils in the experimental school. The investigator originally matched forty-six pairs which enabled her to utilize approximately seventy-three per cent of the fourth grade students in the control school.

The percentile scores of the matched pairs have an interval of zero to five points for both girls and boys.

The age interval of the matched pairs is zero to six months for both girls and boys.

The matched pairs were assigned code numbers for identification purposes in this study. Table I portrays data for the matched pairs.

TABLE I

## DATA FOR MATCHED PAIRS

Coded Student	Age Yr/Mo	Sex	Per-centile Rank	Coded Student	Age Yr/Mo	Sex	Per-centile Rank
1-VG	9-7	F	99	***1-VB	9-6	M	97
1-LG	9-7	F	99	**1-LB	9-9	M	97
2-VG	9-5	F	91	2-VB	9-8	M	97
2-LG	9-2	F	92	2-LB	9-11	M	97
3-VG	9-10	F	91	*3-VB	9-5	M	96
3-LG	10-0	F	91	***3-LB	9-4	M	93
4-VG	9-10	F	91	4-VB	9-7	M	96
4-LG	9-9	F	89	4-LB	9-7	M	92
5-VG	10-2	F	87	5-VB	9-0	M	95
5-LG	9-8	F	87	5-LB	9-0	M	91

TABLE I -- Continued

Coded Student	Age Yr/Mo	Sex	Per-centile Rank	Coded Student	Age Yr/Mo	Sex	Per centile Rank
6-VG	9-0	F	84	6-VB	9-7	M	94
6-LG	9-5	F	84	6-LB	9-4	M	91
7-VG	9-10	F	82	7-VB	9-7	M	94
7-LG	9-9	F	82	7-LB	9-2	M	92
8-VG	9-1	F	80	8-VB	9-11	M	91
8-LG	9-2	F	80	**8-LB	9-8	M	92
9-VG	9-6	F	80	9-VB	9-9	M	82
9-LG	9-3	F	82	9-LB	9-9	M	80
10-VG	9-9	F	77	10-VB	9-5	M	77
10-LG	9-8	F	77	10-LB	9-9	M	80
11-VG	9-8	F	72	*11-VB	9-3	M	72
11-LG	9-7	F	72	11-LB	9-1	M	72
12-VG	9-6	F	72	12-VB	9-10	M	70
12-LG	9-5	F	72	**12-LB	10-0	M	67
13-VG	9-0	F	70	13-VB	9-7	M	70
13-LG	9-1	F	70	13-LB	9-4	M	70
14-VG	9-8	F	70	14-VB	9-5	M	67
14-LG	9-10	F	70	14-LB	9-9	M	67
15-VG	9-2	F	67	15-VB	9-5	M	64
15-LG	9-7	F	67	15-LB	9-7	M	64
16-VG	9-6	F	67	16-VB	9-5	M	64
16-LG	9-9	F	67	16-LB	9-6	M	64
17-VG	9-10	F	64	17-VB	9-0	M	57
17-LG	10-3	F	64	17-LB	9-3	M	57
18-VG	9-0	F	64	18-VB	9-0	M	54
18-LG	9-1	F	67	18-LB	9-3	M	54
19-VG	8-11	F	49	19-VB	9-8	M	54
19-LG	9-0	F	49	19-LB	10-0	M	54
**20-VG	10-4	F	45	20-VB	9-11	M	45
20-LG	9-11	F	45	20-LB	10-0	M	45
**21-VG	9-5	F	41	21-VB	9-1	M	45
21-LG	9-1	F	41	21-LB	9-5	M	41
22-VG	10-1	F	36	22-VB	9-8	M	41
22-LG	10-6	F	41	22-LB	9-9	M	41
				23-VB	10-3	M	36
				23-LB	10-1	M	36
				24-VB	9-3	M	32
				24-LB	9-3	M	32

\* absent during re-testing

\*\* withdrawn during school year

\*\*\* rematched

## CHAPTER IV

### RESULTS OF THE STUDY

This study was undertaken in order to determine whether fourth grade children, taught in a school horizontally organized for team teaching, would achieve as well as, or better than, fourth grade children taught in a school horizontally organized on a self-contained classroom basis.

#### I. STATISTICAL PROCEDURES USED

In order to ascertain whether or not there was a significant difference in the achievement of youngsters in either the experimental school or the control school, the writer tested the null hypothesis by using a "t" test. The "t" test is a test of the significance of the difference between the means of independent populations.

The standard error of the difference is shown by formula 12.8 in Blommers and Linquist's Elementary Statistical Methods in Psychology and Education: (8:348)

$$t(df = n_1 + n_2 - 2) = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

The results of the computations of the Iowa Tests of Basic Skills--Form 2 are summarized in Table II. The raw scores will be found in Appendix C and the computations will be found in Appendix D.

Applying the test of the significance of the difference between the means of the control group and the experimental group, using the achievement of pupils on the Iowa Tests of Basic Skills as a criterion variable, it was found that in ten out of the eleven subtests the null hypothesis must be retained. This indicates that the difference between the achievement of pupils in ten out of eleven subtests is not statistically significant. The difference favored the control group. In this instance the obtained "t" was 2.32 and the tabled  $t_{.05}$  (df = 60) was 2.00.

Since the language area is handled in both schools by teachers in regular class size groups (self-contained), this finding has little bearing on the study. In all the subject matter areas taught by the team in the experimental group (reading, spelling, social studies and study skills) and by self-contained teachers in the control group, the investigator found no statistically significant difference.

TABLE II

## SUMMARY TABLE

SUBTEST	Experi- mental Mean	Control Mean	Differ- ence	t
Vocabulary	30.68	29.68	1.00	.84
Reading Comprehension	47.25	46.93	.49	.20
Language:				
L-1 Spelling	29.33	28.60	.73	.46
L-2 Capitalization	27.18	27.83	.65	.43
L-3 Punctuation	22.23	25.45	3.23	2.32*
L-4 Usage	22.80	22.10	.70	.53
Work-Study Skills:				
W-1 Map Reading	17.83	18.13	.30	.30
W-2 Reading Graphs and Tables	15.35	15.60	.25	.27
W-3 Knowledge and use of reference materials	30.50	31.85	1.35	.70
Arithmetic Skills:				
A-1 Arithmetic Concepts	22.03	22.73	.70	.56
A-2 Arithmetic Problem Solving	17.15	18.08	.93	.78

\* This was the only test that was statistically significant at the five per cent level of confidence ( $.05 t_{60} = 2.00$ )



## CHAPTER V

### SUMMARY AND RECOMMENDATIONS

#### I. SUMMARY

It was the intent of this study to ascertain the difference in achievement between the experimental group and the control group, in hopes that the information could be made available to a local community to inform these patrons that their children did as well as, or better than, children taught in the self-contained classroom.

The writer is happy to be able to inform the district that those subjects being handled by team teaching show that the children in Cashmere are doing as well as those in the control group.

The public relations problem facing a school system attempting any change in routines is important. Bair and Woodward speak of one of the most serious obstacles facing a school system which attempts any substantial change:

. . . Parents, and unfortunately many members of the teaching profession, expect immediate and dynamic results. Lexington's goal has been continuous progress in small annual increments leading to substantial long-range improvement. It is evident that these small increments are being made every year and that fairly substantial progress has been achieved. Certainly the LTTP [Lexington Team Teaching Program] has moved ahead at a slower rate than many would have liked, but it has shown the steady annual improvements for which the Lexington School Committee hoped. (7:191)

The literature on team teaching points to the fact that immediate results are not forthcoming. The research concerning the LTTP show that the results are slow but they are positive and substantive.

## II. RECOMMENDATIONS

The writer recommends that (1) further research using the same instruments be continued over an extended period of time and (2) the third grades be included in the study.

There may be substantial pupil gains which are not assessed with conventional measurements. Such areas as creativity, pupil attitudes, capacity to solve problems, ability to inquire independently, and the ability to learn critical thinking may be measured. As new instruments become available, schools may be able to ascertain pupil gains in these less tangible areas.

While it was not a part of the study to investigate the morale of the teachers in the team teaching setting, in the writer's association with the staff of the experimental school it appeared that morale was high, the teachers were dedicated to their profession, and were forward looking. Only future research will be able to validate findings in this area.

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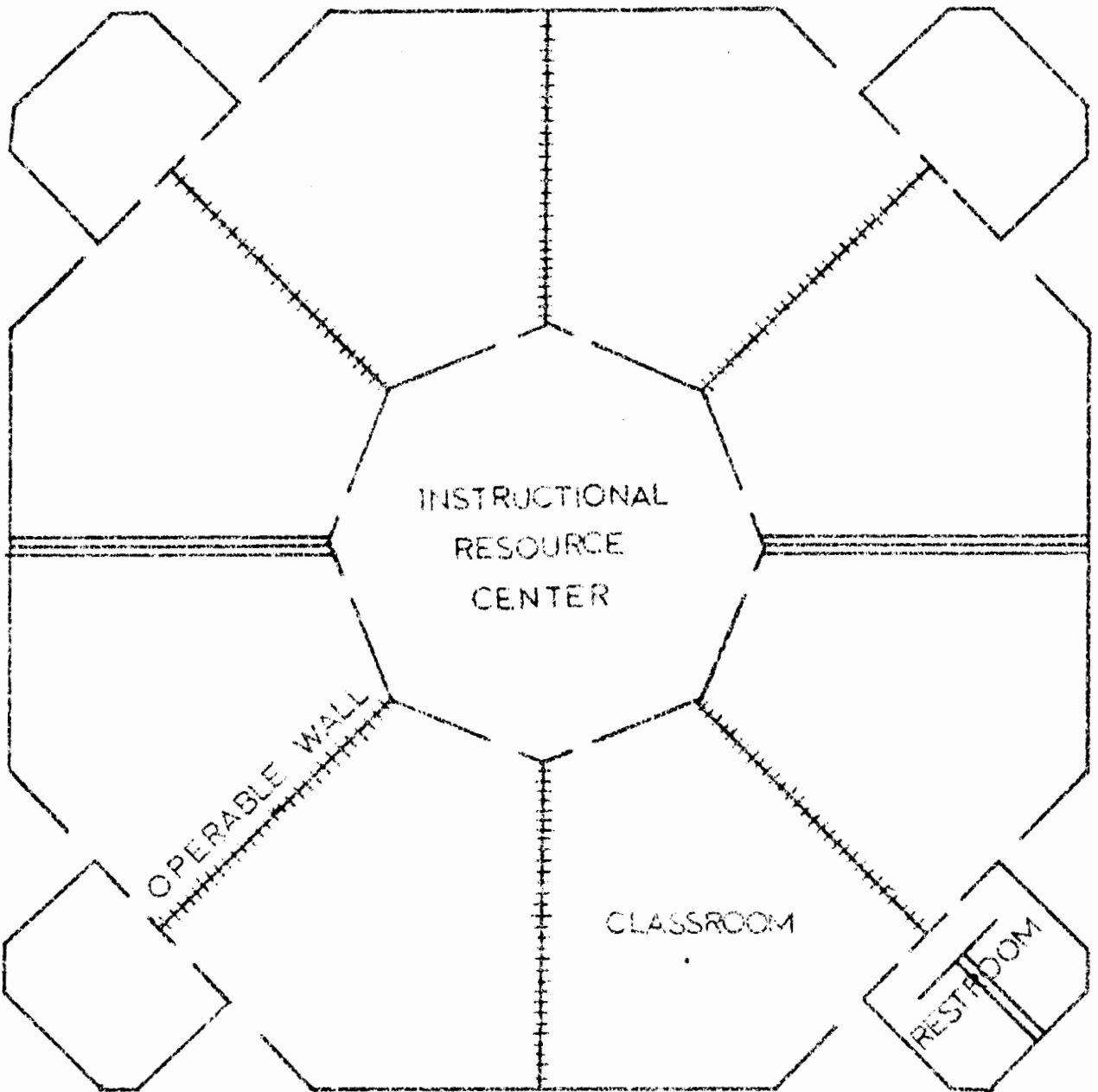
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A P P E N D I X E S

APPENDIX A  
VALE ELEMENTARY SCHOOL  
TEAM TEACHING BUILDING





APPENDIX B: TEST SCHEDULE

IOWA TESTS OF BASIC SKILLS

EXPERIMENTAL AND CONTROL SCHOOL--GRADE FOUR

May 4--7, 1964

DATE	TIME	TEST	WORKING TIME	LENGTH OF SESSION
Mon., May 4th Experimental	9:00 - 10:30 a.m.	Vocabulary Reading Comprehension	17 minutes 55 minutes	1st Session 85 minutes
Wed., May 6th Control	10:50 - 11:25 a.m.	Spelling Capitalization	12 minutes 15 minutes	2nd Session 40 minutes
	12:30 - 1:20 p.m.	Punctuation Usage	20 minutes 20 minutes	3rd Session 50 minutes
	1:45 - 2:50 p.m.	Arithmetic Concepts Arithmetic Problem Solving	30 minutes 30 minutes	4th Session 65 minutes
Tues., May 5th Experimental	9:00 - 10:35 a.m.	Map Reading Reading Graphs and Tables Knowledge and Use of	30 minutes 20 minutes	5th Session 85 minutes
Thurs., May 7th Control		Reference Materials	30 minutes	

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## APPENDIX C:

## IOWA TESTS OF BASIC SKILLS RAW SCORES--FORM 2

VOCABULARY		READING		LANGUAGE SKILLS			
E*	C**	E	C	L-1	L-1	L-2	L-2
37	37	65	57	38	37	35	34
33	36	60	62	32	35	34	35
36	33	63	58	34	33	35	34
38	34	62	61	33	32	26	26
35	35	50	58	28	34	27	32
37	30	51	44	29	31	39	33
31	29	49	57	33	33	28	32
31	27	60	53	32	38	31	32
32	34	58	47	29	26	26	30
23	26	53	45	33	34	29	34
33	31	55	42	32	38	32	32
27	25	56	47	36	34	33	26
29	30	36	39	28	37	19	38
31	28	44	50	25	38	33	25
28	25	46	42	24	29	25	28
32	32	53	49	30	26	27	33
29	25	43	25	14	25	21	18
25	32	47	39	33	27	26	33
27	23	42	45	24	28	27	24
15	10	21	35	16	20	12	22
36	33	58	59	37	32	33	23
38	37	63	55	36	32	37	29
37	32	53	60	36	37	29	34
36	31	62	44	35	28	32	27
38	32	58	47	36	36	34	34
36	34	60	55	35	33	25	35
33	35	42	53	33	27	35	34
26	28	53	56	31	31	30	32
32	32	47	53	38	25	35	17
30	32	39	49	24	21	27	18
28	33	50	33	23	25	24	25
30	29	39	39	27	29	26	28
34	25	27	41	25	17	21	18
27	31	25	39	35	29	12	26
31	31	35	33	19	21	16	15

## IOWA TESTS OF BASIC SKILLS RAW SCORES--FORM 2 (Cont'd)

VOCABULARY		READING		LANGUAGE SKILLS			
				L-1	L-1	L-2	L-2
E*	C**	E	C	E	C	E	C
28	20	25	29	26	15	32	30
20	33	36	41	15	29	16	35
27	17	39	50	19	10	18	22
26	28	36	44	37	24	24	12
25	32	29	42	23	8	16	18

LANGUAGE SKILLS				ARITHMETIC SKILLS			
L-3	L-3	L-4	L-4	A-1	A-1	A-2	A-2
E*	C**	E	C	E	C	E	C
33	36	31	27	34	30	26	24
32	32	25	28	28	26	24	23
30	33	28	27	26	23	23	17
29	27	28	24	28	27	25	19
19	30	29	27	31	24	25	22
14	28	28	20	23	24	7	16
29	29	30	22	19	21	20	22
30	29	26	24	27	22	20	20
17	23	24	27	23	18	22	15
22	25	17	25	31	20	25	22
23	23	28	21	18	23	16	22
20	33	22	15	26	21	22	19
15	30	19	20	18	23	10	16
24	23	17	17	23	27	20	16
17	28	28	24	18	24	12	19
9	23	31	29	18	24	12	21
16	16	29	16	22	14	14	13
22	27	22	25	23	27	19	22
19	21	23	23	16	15	18	22
18	27	8	14	9	12	7	11
30	26	27	27	31	27	23	24

## IOWA TESTS OF BASIC SKILLS RAW SCORES--FORM 2 (Cont'd)

LANGUAGE SKILLS				ARITHMETIC SKILLS			
L-3	L-3	L-4	L-4	A-1	A-1	A-2	A-2
E*	C**	E	C	E	C	E	C
22	28	25	29	28	28	22	24
31	28	29	25	27	31	21	24
31	26	27	29	24	28	24	23
32	33	26	25	27	26	19	24
23	28	30	25	23	30	16	26
32	28	26	22	26	26	19	12
27	26	14	24	23	22	14	16
22	22	22	17	29	25	21	15
20	25	24	25	24	24	17	16
20	25	22	20	15	25	16	15
30	24	21	26	16	23	20	19
7	20	20	18	10	16	7	15
9	23	22	23	15	20	7	18
18	19	15	13	19	25	15	12
25	22	13	12	20	28	11	18
20	12	27	11	21	19	11	8
15	24	9	22	14	16	10	16
22	27	16	19	17	14	17	8
15	9	3	17	11	11	9	9

WORK-STUDY SKILLS						
W-1	W-1	W-2	W-2	W-3	W-3	
E*	C**	E	C	E	C	
24	18	18	19	47	39	
24	19	20	18	35	38	
20	22	20	14	40	39	
19	19	21	19	36	40	
16	17	17	18	41	39	
19	17	18	18	22	38	
21	21	16	15	35	37	
23	11	18	16	28	33	

## IOWA TESTS OF BASIC SKILLS RAW SCORES--FORM 2 (Cont'd)

WORK-STUDY SKILLS						
W-1	W-1	W-2	W-2	W-3	W-3	
E*	C**	E	C	E	C	
15	19	20	12	32	32	
12	13	17	16	40	37	
17	18	13	17	22	33	
20	15	16	16	31	27	
14	19	15	14	22	34	
25	17	20	14	31	27	
11	14	11	17	17	34	
18	19	14	15	33	35	
19	13	16	4	23	22	
14	14	15	18	28	33	
16	16	13	9	33	23	
6	14	11	8	18	26	
23	26	16	21	50	49	
24	23	19	22	44	41	
25	26	20	16	38	42	
22	23	20	20	39	38	
21	19	15	18	44	38	
24	25	21	20	42	42	
18	21	15	15	26	33	
16	11	17	17	36	30	
20	20	20	16	26	30	
21	19	17	15	32	34	
21	16	11	21	32	21	
13	14	15	14	29	18	
10	26	12	17	18	36	
16	21	12	15	25	27	
18	17	15	15	22	23	
21	18	15	6	29	21	
19	16	6	14	18	18	
9	17	4	16	9	24	
8	12	3	15	17	15	

\* E - Experimental Group

\*\* C - Control Group

## APPENDIX D:

## COMPUTATIONAL TABLE

SUBTEST	GROUP	$\Sigma x$	$\Sigma x^2$	N	M	S.E.	t
Vocabulary	E*	1,227	38,693	40	30.68	1.19	.84
	C**	1,187	36,377	40	29.68		
Reading Comprehension	E	1,890	94,926	40	47.25	2.39	.20
	C	1,877	91,379	40	46.93		
Language:							
L-1 Spelling	E	1,173	36,109	40	29.33	1.57	.46
	C	1,144	34,842	40	28.6		
L-2 Capitalization	E	1,087	31,413	40	27.18	1.52	.43
	C	1,113	32,685	40	27.83		
L-3 Punctuation	E	889	21,659	40	22.23	1.39	2.32
	C	1,018	27,040	40	25.45		
L-4 Usage	E	912	22,560	40	22.8	1.32	.53
	C	884	20,496	40	22.1		

COMPUTATIONAL TABLE (Cont'd)

SUBTEST	GROUP	$\Sigma x$	$\Sigma x^2$	N	M	S.E.	t
Work-Study Skills:							
W-1 Map Reading	E*	713	13,683	40	17.83	1.01	.30
	C**	725	13,763	40	18.13		
W-2 Reading Graphs and Tables	E	614	10,160	40	15.35	.91	.27
	C	624	10,292	40	15.6		
W-3 Knowledge and Use of Reference Materials	E	1,220	40,628	40	30.5	1.93	.70
	C	1,274	42,976	40	31.85		
Arithmetic Skills:							
A-1 Arithmetic Concepts	E	881	20,865	40	22.03	1.26	.56
	C	909	21,657	40	22.73		
A-2 Arithmetic Problem Solving	E	686	13,072	40	17.15	1.19	.78
	C	723	13,963	40	18.08		

\* E - Experimental Group  
 \*\* C - Control Group