A STUDY OF THE EFFECTS OF A PARENT EDUCATION PROGRAM ON THIRD GRADE ARITHMETIC ACHIEVEMENT LEVELS

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Thomas A. Mayes

AN ABSTRACT

Submitted to the College of Education
Michigan State University in partial fulfillment of
the requirements for the degree of

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1965

Approved_____

THOMAS A. MAYES ABSTRACT

This study is concerned with the measurement of the effectiveness of an experimental adult education project designed to help parents to supplement the individual attention children receive in their third year arithmetic classrooms. The project involved the participation of one hundred and thirty-nine families in four Flint elementary school neighborhoods during the 1962-63 school year. Kits containing instructions, games, and drills were sent to parents once a week for thirty weeks. Parents were invited to spend as much or as little time on the project as they chose. No materials were returned to school and no grading was made on the work performed.

The hypothesis of this study is that when parents are (1) informed of what is taught in arithmetic at school, and (2) advised on what they can do to help at home, their children will show significant gains in achievement over children of parents not so informed or advised. It is an attempt to make a realistic assessment of a method heretofore accepted in theory only.

An attempt at measuring parents' performance was made by comparing arithmetic means in Stanford Achievement test scores of children of the participating parents against those of children in the two previous third year

classes in the same schools. Additional evaluation was made through a questionnaire distributed to parents.

Interpretative data indicated achievement gains of eight months for one school, six months for two schools, and two months for the fourth school over their respective control groups. Analyses of questionnaire answers cast a favorable light on the project's organization and general design and suggest further experimentation in other subject areas and with parents of more diversified socio-economic backgrounds.

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CHAPTER I

THE PROBLEM

Introduction

Recent years have seen a growth in adult education activities in the United States that differs markedly from the traditional classroom procedure--film forums, civic education symposia, community councils, block leader organizations, adult guidance services, young adult programs. These activities and scores of others longer established in this exciting field of informal learning annually attract over 17,000,000 American adults.[1] In our public schools alone (not counting universities, churches, business and industrial organizations, social, civic, and cultural agencies) there are nearly 100,000 teachers of adults.[2]

Taken at face value, these figures seem impressive. Yet, no one can safely say, in view of multiplying social and educational demands stemming from twentieth century

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[1]Techniques, I, No. 9 (Washington, D.C.: National Association of Public School Adult Educators, April, 1963).

[2]Techniques, II, No. 8 (Washington, D.C.: National Association of Public School Adult Educators, May, 1962).

technological change, that adult education has exhausted its horizons. Actually, it is a relatively virgin field. It offers magnificent opportunities to turn away from the ground plan, the patterns, and formulae that dominate all education and move forward to the creation of new educational patterns in both content and procedure.

Currently, one especially challenging area of adult education is that which concerns the family. The impact of change upon the modern family has intensified the awareness of parents regarding their need for current knowledge about their children's emotional, physical, social, and educational growth needs.[1] Since the task of education at any age is to find ways to help people to make adjustments which they must make to maintain personal effectiveness, the conscientious adult educator should find explorations in this particular field highly rewarding.

Such an exploration comprises the contents of this paper. It describes a project carried out in the public elementary schools of Flint, Michigan, which was designed to help parents to spur their children's educational growth. As is traditionally required by delimitations in doctoral theses, the study narrows down to parents of one

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[1] Public School Adult Educators (Washington, D.C.: National Association of Public School Adult Educators, 1950), p. 7.

particular age group in one particular subject area, and in a few selected neighborhoods. However, the measurements applied to the project may indicate values of significance and suggest broad implementations at future times in other places. The writer will feel justified in having made this report if other educators who read it may feel moved to try similar projects.

Statement of The Problem

This study will describe and analyze the on-going Experimental Arithmetic Project in the Flint Community Schools. The purpose of the study is: (1) to establish the fact that the education of parents in matters related to children's school work results in improved learning by children, and (2) to suggest how an organized adult education program can contribute to solving one of many teaching problems.

Beyond these specific purposes, the study seeks to discover possible by-products: (1) better attitudes toward school on the part of both parents and children, (2) improved parental understanding of the school's objectives, and (3) the development of better study habits on the part of the children.

Thorough-going evaluation involves measurement and testing. In this thesis a questionnaire constructed by

this researcher was used in an attempt to judge the value of the program in terms of attitudes. Comparative scores in established tests were used to determine growth in achievement.

Background and Need for This Study

No writer of dissertations in education should be hard pressed to present sound reasoning to justify the need for crusading causes. The literary woods are full of indignant outcries against--and occasionally for--the status quo. Not a system, a concept, a plan, an order in the education world is without its critics, and not all current criticism is buoyed by mere opinions. The venerable historian, Henry Steele Commager, makes observations which are at once sobering and thought-provoking:

> No twentieth century statesman has accomplished as much as Thomas Jefferson, and none has enjoyed so much leisure.
>
> Emancipation of women, birth control, labor-saving devices, prosperity, and more education should have made a happier and healthier family life, but one out of four marriages ends in divorce.
>
> Our college population is very high, yet, people do not seem better informed or more intelligent.
>
> We have, in our time, witnessed a transition from certainty to uncertainty, faith to doubt, security to insecurity, order to disorder.
>
> In one hundred and fifty years the United States has taken the lead over the rest of the world in science, medicine, law, education, social sciences and has made lasting contributions to art, architecture, literature, and philosophy. Yet, we find

> we have failed to preserve our natural resources, realize promise of freedom, provide adequate education for all children, provide medical aid for all who need it, provide full security for the weak; we have failed to create ideal conditions in which a spacious civilization could flourish.[1]

Commager's words offer a challenge to men of all disciplines, not education alone. Yet, it might not be farfetched to say that professional educators are today the master designers of all progress and change. We may rightfully heap awe and praise on the skillful surgeon who salvages lives, on the statesman whose dramatic manipulations of ideas change the course of history, but we too often forget it is the educator who shapes these men and who molds human minds.

When we view the field of education as a whole, we find it has grown so complex that we no longer have a single "American education system."[2] In addition to our traditional schools and colleges there is now a variety of programs of continuing education recognized under the broad title of Adult Education. It is the multitude of

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[1]Henry Steele Commager, The American Mind-An Interpretation of American Thought and Character Since the 1880's (New Haven, Connecticut: Yale University Press, 1950), pp. 1-40.

[2]The President's Committee on Education Beyond the High School, "Second Report to the President" (July, 1957).

ideas, interests, and activities added to the bare routine of living that has given impetus to the growth of this particular field. Reams have been written of its history, its checkered background of lyceums, Chautauquas, women's clubs, public schools, university extension courses, workers' education classes, and how each has pursued the route of its own self-interest. History of adult education, however, has little bearing on the background for this particular study. What does provide impetus are the collective statements of recognized leaders in the field who ask for a broader base, more meaningful purposes and goals, and courageous explorations for new and useful ideas. Robert A. Luke, Executive Secretary of the National Association of Public School Adult Educators, and an internationally respected spokesman in the field has this to say:

> Adult education along with everything else in the world is changing. It is urgently important that we look ahead to what may be a service of the public schools. It is important that we do this because of the concern all of us have for playing a part in helping raise and sustain the educational level of our communities. . . . There must be a dramatic extension of the kinds of meaningful services we can offer to all citizens.[1]

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[1]Robert A. Luke, "Goals for the Sixties," Focus (Washington, D.C.: National Association for Public School Adult Educators, 1961), p. 133.

Luke's plea for an extension of services echoes prevalent suspicion among other leaders in the field that the challenge of adult education is not being fully met. Studies indicate that in a democracy whose very life's blood depends on voluntary association and participation by all the people, as high as 65 per cent of America's adults are not participating in any meaningful educational, cultural, or social activity.[1] Further, even among those who avail themselves of opportunities in existing adult education programs, 50 per cent of them drop out before realizing appreciable benefits.[2]

Other writings are directly critical and list certain prerequisites for an expansion of adult education. C. Hartley Grattan feels that progress in numbers within the existing framework of adult education is somehow less important than the need for enrichment in the field.[3] Paul H. Sheats, writing of "Present Trends and Future Strategies in Adult Education" in the 1960 Handbook of

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[1]William G. Mather, "Income and Social Participation," American Sociological Review, VI, No. 3 (June, 1941), p. 382.

[2]Stephen Russell Deane, "A Psychological Description of Adults Who Have Participated in Selected Educational Activities" (unpublished doctoral thesis, Graduate School, University of Maryland, 1949), p. 1.

[3]C. Hartley Grattan, In Quest of Knowledge (New York: Association Press, 1955), p. 304.

Adult Education, remarks:

> Observers in related fields have been critical of adult education. . . . The marginality of adult education in the established institutional structure of our society has been ascribed in part to its 'aimlessness,' to its open-ended and opportunistic 'service' approach, of its 'cafeteria' offerings of whatever the public demands, to its policy of drift and the absence of goal-directedness.[1]

Another passage in Sheat's report suggests specific goals:

> A survey is reported in which two out of three respondents see a swing toward community and family improvement as the chief characteristic for a new movement.[2]

The above paragraph gives an example of what other spokesmen are more and more underscoring as pertinent among adult education's new directions--attention to family improvement and parent education and the need for new approaches in this area. Another National Association of Public School Adult Educators' publication forecasts that, while much of adult education should continue to be concerned with the improvement of skills, personal qualities, and appreciation of the individual adult, there should be redirection toward more concrete objectives. First listed

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[1]Paul H. Sheats, "Present Trends and Future Strategies in Adult Education," Handbook of Adult Education (Chicago, Ill.: Adult Education Association of the USA, 1960), p. 559.

[2]Ibid., p. 560.

among these objectives are improved family life and parent-child relationships.[1]

The impact of change on the modern family, the article continues, has inflamed the awareness and sincere curiosity of parents regarding their children's development and school activities.

Homer Kempfer's encompassing and widely read book, Adult Education, also gives latitude to the need for broading the scope of parent education programs. He points out that family structures are changing; urbanization, fluctuations in the size of families, the changing status of women, and other factors leave many adults for long periods without close family ties.[2]

Kempfer and many others sense a great danger in this continuing trend. The Rev. Edward P. Dunne, writing in the Catholic Education Review, points out the importance of strong family relations:

> In civil law as well as in natural law, the parent bears the responsibility of educating the child. The school is a most important aid, but ultimately the task of education remains the responsibility of the parent. A realization of this is necessary if the parent is to play his

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[1]Public School Adult Educators (Washington, D.C.: National Association of Public School Adult Educators, 1956), p. 7.

[2]Homer Kempfer, Adult Education (New York: McGraw Hill, Inc., 1955), p. 43.

proper role.[1]

He feels, too, as does E. Osborne, that children in their daily behavior and particularly in their behavior at school are reflecting their parents' attitudes.[2]

If these writers speak so seriously and alarmingly of changing family structures, there certainly must be evidence of resultant ills. We find this evidence daily in the preponderance of negative statistics in newspapers and periodicals. The National Education Association offers this list:

> One out of every three youngsters who enters school will never finish a secondary education.
> There are a million dropouts per year from our schools.
> Over fifty-five million Americans have not completed secondary school.
> Some eleven million Americans are functional illiterates.[3]

These are facts which are contributing to our national problems of unemployment, delinquency, poverty, crime, swollen welfare rolls, and general discontentment.

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[1]Rev. Edward P. Dunne, P.P., "Parents and The Education of Their Children," Catholic Education Review, LIX (December, 1961), p. 597.

[2]E. Osborne, "You and Your Child and School," Public Affairs Pamphlet, No. 321 (New York: 1961), p. 5.

[3]Facts and Figures on Adult Education, II, No. 1 (Washington, D.C.: National Education Association, December, 1963).

Are parents to blame? After all, parents went to school in their time. Or, does the blame revert to the schools?

It is not this writer's intent to retrace all the stages of human development, starting with chromosomes and genes, in an attempt to pinpoint the original flaw. It is sufficient to acknowledge that there have been changes in our social order and that some of these changes have affected the family adversely. Let us take parents and children as they are, learn what we can do to improve situations, and, in so doing, make the future brighter for them than it might otherwise become.

Why select the parents of small children, as this study does, in seeking one of the necessary answers? Why not study the parents of teenagers--the particular age group which stirs so much controversy? Why not experiment with parents of newborn babies? After all, parent or family-life education is a broad tent covering many activities: marriage, education, prenatal and infant care, child development through adolescence, and marital adjustment during maturity and old age.[1] There is a variety of levels and areas in the field almost equally challenging.

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[1]Kempfer, op. cit., p. 108.

This study acknowledges the importance of building proper attitudes in the young which may carry over through their later school years and into community life. It acknowledges also that the home is the major attitude builder, and that children's attitudes reflect more than anything else their parents' thinking. For instance, a study of 1,200 pupils in a midwestern community (beginning during their elementary years and continuing on through high school) reveals statistically that the majority of dropouts were the children of those who "have had little education, were not successful in school themselves, and less strongly support the school or encourage their children's academic interests."[1]

Finally, the reader may ask why the field of arithmetic in particular was chosen as a testing ground for this parent education program. One answer is the general weakness many children and adults have in this particular field. Catherine Williams reveals that:

> A carefully prepared selective examination was given to 4,200 entering freshmen at 27 of the leading universities and colleges in the United States. Sixty-eight per cent of the men taking this examination were unable to pass the arithmetical reasoning test; sixty-two per cent failed the whole

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[1]Gordon P. Liddle, "Psychological Factors of The Dropout," Education Digest, XXVIII, No. 1 (September, 1961), p. 15.

> test, which included also arithmetical combinations, vocabulary, and spatial relations. The majority of the failures were not merely borderline but were far below the passing grade.[1]

Another reason why this subject was chosen was that the planners of the project were sensitive to the fact that children's attitudes toward arithmetic are often negative, not only in Flint but all over the country, and seem to be growing more so.

In the last few years many changes have occurred in the teaching of arithmetic with the result that today arithmetic has a place of much greater importance in the curriculum. However, even with these changes most of the current literature about arithmetic in the elementary curriculum gives one the impression that arithmetic is still a much disliked subject. Statements such as these appear in periodicals:

> It is only too certain that current pressures on the subject are infecting too large a number of our boys and girls with an enduring fear and hatred of mathematics, which can rarely be overcome later on in high school . . .[2]

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[1]Catherine Williams, Teaching Arithmetic in the Elementary School (Danville, Illinois: Interstate Printers and Publishers, Inc., 1950), p. 1.

[2]Marshal Stone, "Fundamental Issues in the Teaching of Elementary School Mathematics," The Arithmetic Teacher, VI (October, 1959), p. 177.

and,

> . . . most students who have a fear and dislike of mathematics met with some frustration in the elementary grades.[1]

In the New York Times this statement has appeared:

> Attitudes of frustration build up because of insufficient challenge or because of too difficult work in the elementary grades. The students of today's classroom represent widely different capacities and interests which cannot be satisfied through uniform content and method. . . .
> The future of many American scientists and mathematicians depends on how they feel about mathematics in the early grades.[2]

B. R. Buckingham says:

> One of my colleagues at Ohio State University used to dismiss arithmetic with the remark--often repeated--that the subject had come to a standstill, that there was little more to be learned about it, and that those who concerned themselves with it were dealing with trivialities. We knew all we needed to know, he said, about arithmetic, and all of any consequence that we were ever likely to want to know. I fancy, too, that my colleague, if he had spoken his full mind, would have said that arithmetic is a hard subject, an unloved subject, and a subject altogether ungrateful, demanding the strength of the young, and repaying with disappointment.[3]

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[1]Leon McDermott, "A Study of Factors That Cause Fear and Dislike of Mathematics" (Dissertation Abstract 19, M.Ed., Michigan State University, July, 1958), p.71.

[2]"Feel For Science Develops in Youth," New York Times (February 18, 1957).

[3]B. R. Buckingham, "Perspective in the Field of Arithmetic," The Arithmetic Teacher (February, 1955), p. 1.

The gentleman of whom Buckingham speaks may well have run into difficulty in third grade arithmetic. Reasonable or not, the opinions of the above writers merit consideration; and it must be added that those who planned and directed Flint's Experimental Arithmetic Project, during the 1962-63 school year, had other convictions. They believed that:

1. Many children are capable of greater achievement than the classroom situation alone is able to stimulate.
2. The project should be carried out in third year arithmetic rather than in the first or second grade.
3. If difficulties could be corrected as they occur at this level, the child would then progress further and have a better attitude toward arithmetic learning as his school life progressed.
4. Arithmetic is an area which lends itself to objective measurement and to objective evaluation of the children's success in their work from week to week.
5. A fund of adult knowledge and interest in arithmetic exists in each school community,

and that this fund could be reached and used for the benefit of the children in those communities.

6. Most parents want to help their children and to maintain contact with their intellectual life, at least through the elementary school years.
7. Most parents could help their children but could give better help if they, themselves, had a better understanding of the specific classroom activities with which their children are concerned.
8. Most parents feel that the arithmetic curriculum offered by the school is of special importance to their children's development.
9. If the parents' interests and desires are soundly appraised, they could be organized and directed into action which would raise the children's level of achievement.

Assumptions

The following assumptions were considered basic to this study:

1. A system can be devised that will make it possible to inform parents of the experiences of their child in the third year arithmetic classroom.
2. Parents can be persuaded to act on their information.
3. The Kuhlmann-Anderson Test measures intelligence of second year pupils.
4. The Stanford Achievement Test measures achievement in arithmetic and reading.
5. The specially prepared questionnaire for parents contains questions which will reveal pertinent socio-economic backgrounds of parents.
6. The specially prepared questionnaire was answered truthfully.
7. The four schools selected for this study cover a sufficiently representative population to permit selected generalizations.

Scope and Limitations of This Study

This study attempts to measure the effectiveness of a systematic parent information program on the achievement levels of children enrolled in third year arithmetic. Comparisons are made of the arithmetic achievement test scores of the children in the experimental group with those of the children in previous third year classes in the same schools. Some comparisons will also be made between arithmetic achievement and achievement in other subjects. Comparisons will be made between the achievement scores and various aspects of the home backgrounds of the children in the experimental group. It is recognized that the methods used to test performance and gather information for these comparisons are vulnerable in the following ways:

1. Since the Stanford Achievement test is timed and requires reading, the slow or poor reader may be penalized.
2. Children may have been at varying states of mental alertness during testing, resulting in some, if slight, irregularities of measurement.
3. Completion of the questionnaire sent home to parents was not compulsory and some

questions were left unanswered.

4. Some parents may have misunderstood or failed to answer thoughtfully some of the items in the questionnaire either because they did not sense the importance of the project or did not feel sure of the anonymity of their answers.
5. The experimentation was carried out in the lower sections of classes in schools whose student populations were made up of average or middle class homes, and generalizations, therefore, can be extended neither to higher class groups nor to lower class groups.

It should also be understood that:

1. The planners of the project constructed the information materials to fit the content of the course as it was recommended by the Curriculum Planning Department of the Flint Community Schools and as it was presented by the teachers. The planners of this project had no responsibility for the scope or depth of the subject being taught.

Hypothesis To Be Tested

If parents are systematically instructed as to specifically what their children are experiencing in their third grade arithmetic classroom, their children will show significantly greater achievement than children of parents not so instructed.

Importance of This Study

An examination of this study should uncover definite ways to improve education:

1. First, it adds a new and truly useful purpose for adult education.
2. It will show how to utilize effectively an existing but often untapped reservoir of knowledge and valuable voluntary service in homes and communities.
3. It will prove that, in one case at least, there is measurable value in a systematic plan to inform parents about their children's school work.
4. On the elementary level, it shows how better education may be obtained at less cost.

CHAPTER II

REVIEW OF LITERATURE

When we look into the writings which discuss parent involvement in school work, we are at once confronted with a complete absence of directly related materials with which we might compare our own findings. For instance, Avram Goldstein reports that he had examined all articles dealing with home study listed in the Education Index for thirty years prior to December, 1958; and of 280 titles, only seventeen proved to be original reports of experimental research. Of these, none pertain to parents and/or children in the early elementary grades.[1] However, there are many less related studies which, when classified for context, offer a number of emphases: (1) Parent-teacher relations should be strengthened; (2) Parent help is needed for educational growth, especially in the elementary years; (3) Homework which is repetitive and burdensome should be avoided; (4) More attention should be directed to the individual differences of children.

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[1]Avram Goldstein, "Does Homework Help?" Elementary School Journal (January, 1960), p. 221.

Parent-Teacher Relations

The value of "togetherness" between parents and teachers and between the school and the home is expounded with unquestionably sound reasoning by many writers. (Brown, Downes, Elder, and Eicher, whose reports are described in the following paragraphs, are good examples.) Certainly, the arguments of these writers bear logic and their observations are reported with sincerity and obvious good judgment. Yet, no matter how convincing the most dedicated educational writers may sound, they often leave to the researcher the task of discovering in measured amounts the extent of accepted virtues.

In an article appearing in a bulletin published by the Association for Childhood Education International, Muriel W. Brown observes, from apparent broad experience, that the relationships between parents who nurture children and the teachers who guide their education at school are not universally the dynamic, creative, cooperative experiences they can and should be.[1] She says that:

> In many parts of the country, homes and schools are finding good ways of working together. Nevertheless, there is a great need for many

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[1]Muriel W. Brown, "Partners in Education," Bulletin No. 85 of the Association for Childhood Education International (Washington, D.C.: 1950), p. 5.

more people in many places to be thus active.[1]

She suggests that if school-home relationships are to be strengthened, the school must know more about the home and the home must know more about the school.[2] There must be a meeting of minds, and opportunities for people to meet, as the Flint project affords. Brown lists two important steps for the mutual understanding of home-school roles:

1. Roles should be thoughtfully defined and agreements about responsibilities reached by those who wish to cooperate.
2. Possible misunderstandings about roles should be cleared as they develop.[3]

Underscoring values, she states that:

> Wonderful things may happen to children when they sense a unity of purpose between their school and homes. . . . Parents benefit as much as children when homes and schools are in genuine partnership. They develop feelings of status and greater security in the parent role. Their experience is enriched through opportunities to keep up with advancing knowledge about children and their education.[4]

One of the few experiments and investigations in home-school relations as they may affect arithmetic

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[1] Ibid., p. 7.

[2] Ibid., p. 9.

[3] Ibid., p. 25.

[4] Ibid., p. 16.

content and pupil performance is described by Franklin Lester Elder. In 1954, he related:

> . . . a large meeting of parents in a Texas community was called at which a committee of teachers gave an account of the school system's arithmetic program in detail. The committee explained the objectives of the program, described the materials and texts used, the scope of subject content, problems of homework, and grading in the elementary grades. Time was allowed at the meeting for questions from parents and a lively and interested discussion followed.
>
> An evaluation of reactions revealed serious thought on the part of parents. Some 529 questionnaires were returned by mothers and fathers which showed that, by and large, the meeting served a worthwhile purpose, that it was a needed function, and that the parents were on the whole more understanding and supportive of the arithmetic program in general. While this meeting did serve to fill an apparent void in school-home relations, the project did not include a planned home study program or a systematic home follow-up of children's work.[1]

Another specific argument for closer school-home ties in arithmetic teaching is put forth by Mildred Gignoux Downes in a 1960 article:

> In the teaching of arithmetic, the techniques, terminology, and concepts have so altered since your (parents') day that you may be merely confusing Johnny in your attempts to help him. By all means, consult his teacher.

Downes goes further to say that in addition to having some knowledge of subject content, parents should

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[1]Franklin Lester Elder, Explorations in Parent-School Relations (Austin, Texas: University of Texas Press, 1954), pp. 3-32.

use a governed technique which can only be gained by home-school communication.[1]

A recent article in The Detroit Free Press, written by Majorie Eicher, tells of a parental furor which followed the introduction of modern math in some of the Detroit schools. The story states that there was wide suspicion among fathers and mothers regarding "radical" approaches to the study of arithmetic, but that parents accepted the plan enthusiastically after a series of introductory and descriptive lectures given them at school by their children's teachers.[2]

In fields other than arithmetic, more scientific studies have been made of home-school relationships--or the lack of them. One such study, conducted by Edwin Mingola, sought to uncover possible causes for underachieving in reading. The project, carried out in three California communities, found a high positive correlation between high elementary reading levels and informed, well-educated, and school-associated parents. An important cause for underachieving, Mingola reports, is overpressure

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[1]Mildred Gignoux Downes, Homework--To Help or Not To Help? (Clearing House, January, 1960), 34:283-5.

[2]Majorie Eicher, "The New Math," The Detroit Free Press Sunday Magazine (February 23, 1964), pp. 4-8.

from "taskmaster" parents ignorant of the schools' objectives and of good teaching practices.[1]

Another report, by Emmett Albert Betts, points out rather similar findings in a Florida community. It adds little other than further statistical support to what is already generally assumed: The cultural level of the home influences a child's reading achievement level. Also, it points out that among parents those of high educational attainment were those most closely involved in school affairs. It should be safe to assume that parents involved in school affairs generally are better informed on their children's needs.[2]

Somewhat more interesting than either of these studies, however, is Frank W. Lanning's experiment in paired--or "dyadic"--reading. The project, conducted in the fifth grade of the Eastern Illinois University laboratory school, found, after extensive trials and measurements, that when a child is studying with a classmate whom he likes and enjoys, he is likely to progress at a more

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[1]Edwin Mingola, "Possible Causes of Underachievement in Reading," Elementary English (March, 1962), p. 220.

[2]Emmett Albert Betts, "Impact of Adult Reading On Pupil Achievement," Education, LXXXII, No. 1 (September, 1961), p. 29.

rapid pace than if he were studying alone.[1] Would this principle, this writer wonders, hold just as true if a child were paired with an enjoyable, understanding, and informed parent in the study of another subject?

Parent Help Is Needed

Not so much has been written on the fact that parents can help their children with their school work. Much more is written on the fact that they should help.

John B. Mitchell, in his 1961 article, The Family Teaches, Too, theorizes that parental attitudes, more than attitudes of teachers, exert the greatest impact on a child's life. He addresses a strong opening statement to parents:

> Your home is a school that is always in session and you are the teacher. Your children are learning something from each utterance and every social experience.[2]

He feels that many parents fail to appreciate the fact. Mitchell defines the family as the basic nurture group for its members, and explains that the term,

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[1]Frank W. Lanning, "Dyadic Reading," Elementary English (March, 1962), pp. 244-245.

[2]John B. Mitchell, "The Family Teaches, Too," Childhood Education, Journal of the Association for Childhood Education International, XXXVII, No. 7 (Washington, D.C.: March, 1961), p. 310.

nurture, means more than supplying the food needs. A child's social and psychological needs are many and must be satisfied if he is to be happy. Mitchell continues:

> Unlike other mammals, man has no instincts. We may consider a pattern of behavior that does not have to be learned--an instinct. For example, a robin knows exactly how to build a nest without having to learn how from another robin. Although man has no instincts, he has a tremendous capacity to learn. Superior mental capacity is one of the factors which distinguishes man from other mammals. Another factor is that human beings are helpless and dependent longer than any other mammal. These two factors contribute to the family being a basic nurture group that is universal.[1]

Concluding his article, Mitchell says that a child can realize his wish for new experiences less painfully through guidance provided by parents. This is an opinion--if not a fact--which bears consideration from anyone charting new experiments in teaching and learning, third year arithmetic or anything else.

Not only have great changes come about in the field of mathematics in recent years, the attitudes of teachers toward the parents' part in helping with arithmetic homework have changed too.[2] For example, according to Sidonie M. Gruenberg's 1961 article in Childhood Education,

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[1] Ibid., pp. 310-312.

[2] Ibid.

a generation ago teachers did not want parents to help. They said it confused the children if, for instance, father did the subtraction or division in one way and the teacher in another. Furthermore, they said, the teachers, themselves, were confused, not knowing how to evaluate a child's work if father helped with math and science, mother with literature and map making.

This attitude has widely changed nowadays, says Gruenberg. Today, she says, there is so much pressure on teachers in overcrowded classrooms that parents are expected to help. Parents, too, feel the pressure and fear that their sons and daughters may not be admitted to college. In the not-too-distant future we may come to understand that home is a place where children are educated--even in the sense that parents and children spend evenings doing school work together as a ritual. This may, of course, smack of extremes, of overdoing a good thing to the point that it hurts, but, at least, Gruenberg has something to say on our behalf.[1]

Jerome D. Frank calls for more action and less

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[1]Sidonie M. Gruenberg, "Our Children Learn at Home," Childhood Education, Journal of the Association for Childhood Education International, XXVI, No. 4 (Washington, D.C.: December, 1959), p. 161.

talk in the parents' roles in learning situations. In a 1953 report in Child Study he charges that there has been such an influx of writing and lectures on child guidance and parents have fallen into such a habit of reading and listening that they are neglecting active roles which are and should be their true responsibility.[1] He feels that the school, as far as its relationship with the home is concerned, should offer more than theories and discussion topics; it should offer programs of action, projects in which parents can take a vital, useful part.

Going into specifics, Frank adds that in contributing to a learning situation, parents should attempt to make a project or study topic so relevant to the child's purposes that he becomes involved in it--in other words, a learning situation should supply the child with incentives to apply what he learns both to his present activities and to the rest of his life. He calls for practical content in learning materials.[2] There is no question that Frank would have shared the inspiration of those who prepared the mate-

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[1]Jerome D. Frank, "How Do Parents Learn?" Child Study (New York: Child Study Association of America, Summer, 1953), p. 18.

[2]Ibid.

rials used in Flint's Experimental Project.

Encouragement for parents to learn with their children in scientific subjects is given by Glenn O. Blough in a recent National Education Association brochure. He writes:

> You may find that a study of some of the things your child is concerned about is more interesting than you thought it could be. Together you and your child can locate sources of information and plan activities that provide opportunity to observe, to experiment, and to record data and observations. One of your contributions in this joint learning activity is the knowledge that you have of resources, that are available (at home), and how to use them.[1]

The author points out further that a child, because he doesn't know where to turn for information he wants and can understand, may lose his initial spark of interest in mathematics, astronomy, geology, or some other scientific concern.[2] Parents can help greatly, he says, by simply showing an interest in some aspect of science that is also of concern to the child. Realization that parents respect their science interests and information and are willing to learn from them as well as with them, gives children a dignity and sense of

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[1]Glenn O. Blough, You and Your Child and Science (Washington, D.C.: Department of Elementary Principals, National Education Association, 1963), p. 19.

[2]Ibid.

intellectual responsibility that actually reinforce their efforts to learn.[1]

Hartung, et al, say that practical appreciations of arithmetic such as can be inspired at home have long had a "fashionable" recognition and acceptance by teachers, as a teaching aid. However, they say, the reason that there is no widespread organized use of such methods or techniques is that teachers have not provided the motivation that will encourage parents to do as much as they are competent to do.[2] This seems to give validity to the Flint project. In addition, these writers say that a home study program should steer clear of compulsory timed exercises and should popularize "fun" projects.[3]

In a 1955 study of parent responsibility in child development, Louis Lowy emphasized the need for both mother and father to take an essential part in the upbringing of their children.[4] He feels that fathers today

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[1] Ibid.

[2] Hartung, Van Eugen, L. Knowles, and Gibb, Charting the Course for Arithmetic (Chicago: Scott Foresman and Company, 1960), pp. 65-66.

[3] Ibid.

[4] Louis Lowy, Adult Education and Group Work (New York: Whiteside, Inc., 1955), p. 1925.

want to assume their fair share in their children's educational process. He says that the 19th century pattern of mother domination is not only out of style, but, from the viewpoint of modern psychological concepts, wrong.[1]

Another modern characterization of the parent role is brought out when Lowy states:

> Parents are no longer masters who demand blind obedience from their children; they all are part of a democratic grouping in which they have vested certain rights and responsibilities, not vested authority.[2]

An interesting revelation of faulty parental attitudes toward arithmetic achievement was reported by Mary Preston, M.D., over a decade ago in Child Development. Dr. Preston made a study of 100 children with I.Q.'s ranging from 90 to 140 and conducted interviews with their parents. She made this observation:

> In general, failure in arithmetic has long been accepted in a matter-of-fact way, with the excuse that the child 'takes after' the mother or the father. On the other hand, no such attitude was found toward reading failure in the parents interviewed. The child that cannot read is one set apart, abnormal, queer, not quite right. To get mixed on fractions and decimals is understandable but to be unable to read--that

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[1] Ibid.

[2] Ibid.

is beyond the pale.[1]

She speaks strongly for more refreshing approaches to the teaching of arithmetic and adds a plea for parent and teacher cooperation to help popularize this important subject.[2]

A decade ago Edwina Deans was promoting the idea of parent help with arithmetic. She wrote a bulletin designed to make such help valuable. The reader finds not only close coincidence between Deans' theory and the one on which the Experimental Arithmetic Project was based--Deans also endorses similar methods and practice materials.[3] She explains that her booklet was not intended to be all inclusive, but rather was an effort to give illustrations of typical arithmetic activities children experience at school and at home, to suggest ways in which the home may supplement school experience, and to indicate how the school may capitalize on home experiences to strengthen the school program. She assumed that parents will appre-

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[1]Mary I. Preston, M.D., Parental Attitude Toward Arithmetic Achievement, X, No. 3 (Washington, D.C.: Child Development, National Research Council, September, 1939), p. 173.

[2]Ibid.

[3]Edwina Deans, Arithmetic--Children Use It! (Washington, D.C.: Association for Childhood Education International, 1954), p. 3.

ciate an opportunity to learn the whys and wherefores of methods which are new to them.[1]

Described in the booklet was an evening meeting between teachers and parents. Here we find much the same eager, natural curiosity we found among parents at the Flint parent-teacher meetings. Parents asked, "What is expected of eight-year-olds? What can we do at home to help our children in arithmetic?"[2] Parents and teachers, Deans theorized, can be eventually helpful in the business of building understanding for arithmetic and competence in the use of number processes, and newsletters and individual conferences are ways of gaining mutual understanding. Among the home activities suggested by Deans are playing games with numbers, working in the shop, cooking, planning together, earning money, assuming home responsibilities which may require counting or keeping time.[3]

How effective was Deans' crusade? No further studies indicate a recorded evaluation. Neither is there an indication that varying ages of children and varying home backgrounds may or may not be criteria in the outcome.

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[1] Ibid., p. 4.

[2] Ibid., p. 48.

[3] Ibid., p. 56.

Indeed, Flint's Experimental Arithmetic Project may not be a spanking new idea from all viewpoints, but as far as recorded research is concerned, it seems to be the only one to which serious measurement has been applied.

An English work includes a study by John Morrison in which he states that it has been noted by many teachers that the home is a source of "number knowledge." He lists many home activities--such as running errands at the store, counting change, telling time, free play, conversation--which contribute to a child's arithmetic learning. The home, of course, may leave the greatest influence on a child's learning and development, but little or nothing has been done in a controlled, systematic way to guide these home experiences toward specific desired ends. This is one of many articles which points to the need of such a program as Flint's Experimental Arithmetic Project offers.[1]

The Role of Homework

What is or should be the status of homework for elementary school children? How do parents feel--and think--about it? What is the consensus of professional

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[1]John Morrison, The Teaching of Arithmetic (London, England: University of London Press, Ltd., 1950), p. 3.

opinion? Recent trends indicate growing uniformity of thinking.

A 1951 bulletin distributed by the U.S. Office of Education reflects current feeling among the majority of educators that serious, overburdening homework for elementary school children is unmerited and even harmful. It states:

> Most educators hold that homework in the regular sense is wasteful. . . . They believe children ought rather to play, to pursue hobbies, to dance, to take part in home and family responsibilities, to enjoy an evening in activities the entire family enjoys.[1]

The report backs up its argument by stating that of seventy-two articles on the project of homework received "recently" by the U.S. Office of Education, most authors voiced objection to assigned school study to be done at home or warned of resultant dangers to personality development.[2] One of the governing issues in the Experimental Arithmetic Project is that the materials taken home by children are chiefly recreational in nature and designed to draw the interest and enthusiasm of both parents and

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[1]"How Children Use Arithmetic," Bulletin No. 7 (Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1951), p. 11.

[2]Ibid.

children. The materials, primarily, are for fun. Those who prepared the materials underscore the fact that timing is unimportant, that to use them at all should be voluntary. It should be noted, also, that no formal grading was done by teachers on the materials. Indeed, we find this project dovetailing with popular thought on the elementary home study programs.

Avram Goldstein, writing in the Elementary School Journal, further places the strength of professional opinion behind the teaching methods used in the Experimental Arithmetic Project. He writes that studies at the elementary school level show that voluntary homework has as many values as compulsory homework may have at its best. The article states:

> The trend of thought is in the direction of letting such homework as is to be done be of the optional or recreational type, thus, utilizing the opportunities of the school to stimulate worthy use of leisure time.[1]

Further reading, however, reveals that no evaluation has been made on such study methods as they might apply to any particular field of study.

Games and "fun experiences" are the most effective learning incentives for early elementary children in the

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[1]Avram Goldstein, "Does Homework Help? A Review of Research," Elementary School Journal (University of Chicago Press, January, 1960), pp. 212-217.

opinion of Clarice Whittenburg.[1] Her 1950 article warns against an overuse of drills.

Gladys Gardner Jenkins has this to say:

> . . . parents who urge a child to do better without understanding why he is not making progress may end up with an underachiever.
>
> A child who feels comfortable with his parents and teacher . . . who finds it safe to ask questions, express ideas, come up with opinions, try doing things even if he makes mistakes . . . responds to pressures within himself by carrying through a successful performance.[2]

Their reports are generally in accord with the attitudes of other recent writers on the subject of homework, and, also in line with most of them, they speak from experience regretfully unsubstantiated by the bold facts and figures of research and evaluation.

Waldemar Olson comes close to the heart of the materials of this study when he suggests that homework should be "personalized."[3] He says that children in third year arithmetic should not necessarily have the

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[1]Clarice Whittenburg, "Homework That Counts," Journal of Education (Education Index, November, 1950), 33:262-63.

[2]Gladys Gardner Jenkins, "What Price Pressures," Childhood Education, XXXVII, No. 2 (Washington, D.C.: Association for Childhood Education International, October, 1960), p. 54.

[3]Waldemar Olson, "Homework: Friend or Foe?" The Instructor (January, 1962), 71:6.

same assignments but rather they should be given projects directed toward individual achievement.[1] Like Goldstein and Whittenburg, Olson cautions against serious, excessive homework and claims teachers "cannot raise a child's potential for learning by merely 'pouring it on.'"[2] While Olson adds convincing support to the methods used in this project, his writings give no hint that a scientific measurement had been applied in the course of his teaching experiences. His entire treatise is, basically, one of opinion.

Edmond F. Erwin is perhaps more supportive of serious research into methods of solving the home-study question. He writes in an issue of Child Study:

> Homework--or home study--has traditionally been thought of as a source of endless conflict between a child and his parents, and we are still a long way from finding the way to avoid all such tensions of strengthening good family relations. . . .[3]
>
> The elementary years offer an especially good chance to make homework a bond instead of a battleground. For some elementary children home drill exercises are necessary if they are to keep up with their classes and the parent is

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[1] Ibid.

[2] Ibid., p. 8.

[3] Edmond F. Erwin, "The Parents' Part in Homework," Child Study (Child Study Association of America, Spring, 1959), p. 15.

> expected to play a daily part in these exercises. If these tasks are carried out in a pleasant atmosphere of a shared adventure, they can bring the parent and child closer together.[1]

Erwin speaks from the standpoint of experience, like so many others. His opinions, although meaningful and certainly clothed in a substantial amount of good reasoning, point up the urgency for educators to develop methods and materials and test their effectiveness under close research.

How do parents feel about homework generally? What do they expect their children to bring home from school? Some light is thrown on this topic by Ruth Strang in a recent article in the PTA Magazine. She claims that parents expect suggestions from teachers, suggestions which may wisely guide them in helping their children. In addition, she points out a widely accepted understanding that improved school-home communication brings about mutually beneficial results.[2]

Attention To Individual Differences

During the past thirty years, instructional pro-

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[1] Ibid.

[2] Ruth Strang, "Helping Your Child With His Homework," PTA Magazine (November, 1961), p. 25.

cedures in the elementary schools have been steadily under attack. Demands for adaptations to individual differences have become more insistent.[1] It is ironic, however, that the growth of methods and materials has not been matched by vigorous research into their effectiveness.[2] One of the few research-supported appraisals of arithmetic teaching materials and methods for the elementary grades is found in the 1955 National Education Association report prepared by V. L. Glennon and C. W. Hunnicutt. These writers say that individual attention is the most needed criterion in effective teaching, and that classroom teachers with popularly sized classes find it impossible to devote the necessary time to each and every pupil. Their report also warns against an emphasis on drills in the early years.[3] The use of flash cards, it remarks, is perhaps a proven teaching method, but their overuse may evoke boredom and habitual memorizing. There should be more teaching materials which inspire creative thinking and

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[1]Chandler, Stiles, Kitsuse, "Education in Urban Society" (New York: Dodd, Meade & Company, 1962), p. 170.

[2]Ibid., p. 177.

[3]V. L. Glennon, C. W. Hunnicutt, "What Does Research Say About Arithmetic?" (Washington, D.C.: Association for Supervision of Curriculum Development, National Education Association, 1955), p. 25.

reasoning.[1]

The Cincinnati Public Schools two years ago began an experimental arithmetic program in the elementary grades. The project was described by Evans, Headley and Leinwohl in the Arithmetic Teacher as a creative approach, using a variety of practice materials. Description of the materials reveals they are much similar to those used in the Flint Project.[2] However, all work in the Cincinnati program was carried out in school and no parent involvement is mentioned. While the report ends with an inspirational note, the project was not factually evaluated.

L. W. Harding and Pose Lamb in a 1962 article called, Children Consider Mathematics, speak out strongly for an individual approach to teaching. They point up present day errors in teaching by cautioning that, to most people who have never studied them carefully and sympathetically, children of a given age or size are much alike. Since children outwardly appear to be so similar, there is a widely held assumption that they think alike. This assumption, say the authors, leads to another, that children of like sizes and ages can be taught alike. All too fre-

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[1] Ibid.

[2] Evans, Headley, Leinwohl, "An Enrichment Program for Elementary Grades," Arithmetic Teacher (May, 1962), pp. 282-289.

quently a third assumption is that the proper method of instruction is repetitive work on computational skills.[1] The authors proceed with an excellent argument against such a narrow emphasis. They point out that the potential for learning varies widely among children of the same age or grade level and their rates of progress vary from pupil to pupil, and for any one pupil from one time to another.[2] Finally, children's reasoning processes not only vary from adult types of reasoning but appear to be highly individualistic. One possible answer to individual differences, the authors offer, is to add parents' time to the teacher's time. They say:

> The boisterous child is more likely to get the teacher's help than the quiet child, and the words, 'squeaking wheel gets the grease,' appear to be applicable to the study of elementary arithmetic as in so many other places.[3]

A search for new, exciting ways to teach elementary arithmetic is encouraged by J. F. Weaver, who feels that there is more than one acceptable means to reach desired ends. His article attacks rigidity of most current teach-

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[1] L. W. Harding and Pose Lamb, Children Consider Mathematics (Columbus: Association for the Study of Mathematics, Ohio State University, 1962), p. 13.

[2] Ibid., p. 14.

[3] Ibid., p. 20.

ing methods. While he directs much of his criticism toward content in the curriculum, he would doubtlessly, judging his article as a whole, give support to our approach to teaching.[1] (Note: He says, change!--but doesn't say how.)

The Curriculum Department of the Minneapolis Public Schools several years ago called attention to the importance of home activities in the "individualized" teaching of arithmetic.[2] The superintendent of schools, Rufus A. Putnam, published a list of ninety-four such activities which had marked relationship to arithmetic teaching. These include:

Learning from other children

Practice with flash cards

Various games requiring counting of spaces

Counting objects in the home

Use of calendar, clock

Keeping scores on games

Measuring by yardstick

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[1] J. F. Weaver, "Basic Considerations in the Improvement of Elementary School Mathematics Programs," Arithmetic Teacher (October, 1960), pp. 269-273.

[2] A Guide to Teaching of Arithmetic, Kindergarten Through 12th Grade (Minneapolis, Minnesota: Minneapolis Public Schools, 1955), p. 20.

Helping with cooking, measuring ingredients

Asking questions about measuring devices

Purchasing food and materials for clothes.[1]

To one degree or another, these items were included in the kits sent home by teachers participating in the Flint experiment. However, only our study gives an evaluation on their usefulness.

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[1] Ibid., pp. 20-23.

CHAPTER III

NATURE OF THE STUDY AND METHOD OF INVESTIGATION

Flint educators for the past thirty years have had opportunities to experiment with a large number of problem-solving school projects, particularly as they pertain to total community involvement in upgrading and enriching the curriculum. Funds for these experiments have been provided by the well-known Charles Stewart Mott Foundation which is currently spending around $2,000,000 yearly on a variety of community school programs. This "seed money," as Foundation officials prefer to call it, underwrites school-administered, school-centered programs in health care and education, adult education and recreation, curriculum enrichment, youth delinquency prevention, and high school drop-out rehabilitation.[1]

The thinking of the planners of the Experimental Arithmetic Program was guided by the established Flint

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[1]Peter L. Clancy, "The Contributions of the Charles Stewart Mott Foundation in the Development of the Community School Program in Flint, Michigan" (unpublished Ph.D. thesis, Michigan State University, 1963), pp. iii-iv, in Abstract.

Community School concept--that in the people and in the community there are reservoirs of knowledge and educational materials that can be tapped to permit greater attention to individual needs in learning. They sought to know what might be the effect of an organized adult education information program on the achievement levels of elementary school children and on the parents' attitudes toward the school and its program. The most conscientious teacher in the best run classoom can regularly provide each child with only a few seconds of truly individual attention every day. If parents can be led to give their children extra minutes of skillfully directed help at home--once or several times a week--this assistance might multiply by a number of times the personal attention a child normally receives in the classroom and, consequently, might exert a favorable influence on achievement levels. This experience might also strengthen ties between parents and the school and result in more harmony in other courses of study, other activities.

In organizing an experimental group for this study, the adult education staff made its selection with an eye on the make-up of the students and their need for the help this project might afford, if successful. Important, also, were the locations of the schools. They had to be

fairly well spread out so that a plausible cross section of the population might be studied. Another factor was the make-up of the administration and staff of the schools selected. They had to be persons receptive to the plan and understanding of its goals.

One hundred and thirty-nine sets of parents of third year arithmetic students in four Flint elementary schools were selected for this experiment which began in the fall of 1962. In this study, these schools will be designated as schools A, B, C, and D.

School A was chosen because of the strong interest of the mathematics teacher in that school in finding a way to do more for her students than she had been able to do before. She had, furthermore, been teaching third year arithmetic for several years in this school and, thus, contributed a constant factor for measurement. This school was organized on the platoon system with eight sections of children meeting with this teacher approximately thirty minutes each day. Since classes averaged more than thirty students each, a theoretic possibility did, indeed, exist of less than one minute per pupil, per day, of personal attention.

The academically lower two sections of third year arithmetic in School A were selected with the belief that

in the lower groups there was a greater need for opportunity to secure additional parent help. Also, some related experimentation had been carried out along the lines of the study in School A the previous year.

School B had also been experimenting with means of using parent help to support the classroom activity, and its personnel were not strangers to the ideas of this experimental program. The school had self-contained classrooms. The lowest achieving classes, among three sections of third graders, were chosen as experimental and control groups. None of these groups had the same teacher.

School C had one of the most "transient" populations of all Flint elementary schools. This disproportionate turnover in a student body appealed to the project planners as a difficult but desirable feature for study since they hoped to discover the effects the program might have on students who were frequently absent or often transferred. The program, they felt, should provide a means for helping children who had been ill, or who had entered with less arithmetic background. This school had only one third year section in a self-contained classroom and the teacher factor was constant for both experimental and control groups. Both Schools B and C enjoyed administrations especially sensitive to the critical nature of

third year education in arithmetic.

School D also had self-contained rooms and more than one third year section of which the lowest was selected for experimentation. The experimental group and one control group had the same teacher.

As a first step in organizing the project, the adult education office sent letters to parents of children enrolled in the selected third year arithmetic classes in the four schools inviting them to an informal evening gathering at their school. Meetings were held in four different schools on different nights so that the adult education workers could be present before all four groups to explain the purposes of the project. These meetings were well attended and discussions were open, responsive, and favorable.

Every week for thirty weeks all parents of the children in the experimental groups were supplied with four kinds of information:

1. A statement of exactly what was currently being taught in arithmetic.
2. General suggestions as to games the parents could play and exercises they could do with their child.
3. A statement as to the degree to which their

own child was succeeding.

4. Specific suggestions as to games the parents could play and exercises they could do with their child that would help him overcome his individual weaknesses or exploit his individual strengths.

In addition to this information, materials were sent home to be used by parents with their children. Homes and businesses in each school neighborhood donated yardsticks, rulers, milk cartons of various sizes, and counters. Games were purchased with funds from the Mott Foundation. Flash cards, fraction circles and cubes, number wheels, cardboard thermometers, bean bags, and additional games were made for the project by fathers who were members of each school's Men's Club. (Samples of the weekly take-home kits are included in the Appendix.)

The take-home materials did not include compulsory assignments and could not be rightfully called homework in the usual sense. Parents and children could give as much or as little attention to the project as they were moved to give. Nothing was returned to school for correction or grading. In a word, this was more a recreational or social program designed to bring the family closer

together for the mutual enjoyment of working with one another--with hoped-for beneficial side effects.

The thirty consecutive weeks of the project were divided into three, ten-week intervals. The parents were asked to come to the school in groups twice during the experiment to discuss with curriculum consultants and adult education staff members, principals and classroom teachers what could and could not be properly done in a venture of this sort. At these meetings, it was stressed that participation was voluntary, and that a good relationship between the parent and his child was necessary if any degree of success was to be achieved. Suggestions from parents were noted, and adjustments in the program were made where feasible. About one-half the parents came to one or both meetings. Among these were some who had never before been reached by the school. Even though not all the parents attended the meetings, a written response to a survey form sent home with all the children in the experimental groups indicated that the parents of all but a few of the children were regularly using the materials.

In each school a clerical worker who had the necessary educational background and experience and who was acceptable to the principal and the classroom teacher was hired to assemble the weekly kits for the parents. The

kits were developed under the direction of the adult education staff and the classroom teachers of the children involved. The teachers were paid $5 an hour for hours spent on the project beyond their regular school day.

In order to make measurements of the effectiveness of such a program as the Experimental Arithmetic Project, comparisons must be made of a variety of factors. The children had to be tested for before-and-after effects, and the parents "felt out" through questionnaires for their socio-economic backgrounds, their attitudes toward education and the project in particular. Whatever tests were used had to be established instruments, accepted by workers in the field of educational testing, and tests that fit into the general Flint schools' policies as they pertain to testing. They had to be of sufficient depth to cover other areas of performance than arithmetic. They had to be accompanied by sufficient descriptive material to enable the investigator to judge their reliability, validity, and general design.

Fortunately, regular testing schedules in Flint's elementary schools included two tests administered to all children in the fall of their second year and another test in the spring of their third year. The first test is a general I.Q. test, the Kuhlmann-Anderson test. The other

is the Stanford Achievement test. The researcher theorized that by taking scores from these two tests he would, to begin with, have a formidable battery of statistics from which he could draw conclusions as reliable as he could expect from any other combination or combinations. Also, truly noteworthy comparisons could be made between the achievement levels of the children in experimental groups and the achievement scores of children in control groups, made up of previous third year classes, in the same schools. Further, he might compare arithmetic achievements of the children in experimental groups as they were revealed in the Stanford test with:

1. The I.Q.'s of the children
2. The reading levels of the children
3. Educational level of the parents
4. The socio-economic home background

Many other items could be brought into analysis--study habits and patterns as they related to progress and achievement, and the amount of help or frequency of attention given by parents.

The Kuhlmann-Anderson test, given to all second year children each fall in Flint, was chosen by the Flint Schools Testing Department because it does not involve reading and has been found to be highly correlated with

the Binet test.[1] This test is largely pictorial. It involves picture completion, locating the incorrect or superfluous part in a picture, classifying objects which belong together, identifying objects which fit various orally described specifications, copying or completing designs, matching figures, counting, completing series, following directions, finding pieces which can be fitted together to make a given figure, and similar tasks.[2]

Gronbach commends the test on the grounds that in performing the test few pupils encounter items where they have to guess, and the test is shorter because unnecessary, easy items are eliminated.[3] He also says that the Kuhlmann-Anderson test follows the Binet principle of combining such a great variety of tests that no one specialized ability plays a large part in the score.[4]

The Stanford Achievement test is given to all Flint third graders late in the spring of each year. It has been

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[1]Interview with Vivien Ingram, Coordinator, Testing Department, Flint Board of Education, Flint, Michigan, April, 1964.

[2]Anne Anastasi, Psychological Testing (New York: MacMillan Company, 1954), p. 10.

[3]Lee J. Gronbach, Essentials of Psychological Testing (New York: Harper and Brothers, 1960), p. 218.

[4]Ibid.

used with revisions in the Flint schools since 1932. It covers reading comprehension, vocabulary, spelling, arithmetic reasoning, and arithmetic computation.

This test is standardized and more widely used nationally than any other achievement battery. Several timely revisions of the test have greatly improved the norms and score conversions without radically altering the text content. Two-thirds of the reliability coefficients are .88 or better.[1] One drawback of the test as it applies to this project is that it includes reading in arithmetic reasoning, penalizing poor or slow readers.

Another instrument used was a questionnaire prepared by this researcher to reveal the background and current socio-economic status of the parents, their attitudes toward education in general, their evaluation of Experimental Arithmetic Project, and the study habits of their children as applied to the materials of the project. Beyond offering an evaluation of the project from a parental standpoint, the questionnaire also sought suggestions for improvement of the materials and the plan in general for future implementation.

The items in the questionnaire could be grouped

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[1] Ibid., p. 384.

under the following headings. The numbers appearing below the headings are the numbers of the questions which pertain to that heading.

1. Study habits
   A2, A3, A6, A7, A8, A9

2. Evaluations
   A1, A4, A5, A10, A11, A12, A13, A14, A15, A16

3. Parental attitude toward education
   B3, B4, B5

4. Background and socio-economic status
   B1, B2, B3, B4, B6, B7, B8, B9

After a satisfactory trial test on fifteen families, this questionnaire was sent home through the children with an explanatory letter from the principal. Copies of the letter and the questionnaire are shown on pages 169-170 of the Appendix.

Since some of the items in this questionnaire were of a nature which most parents may have wanted to answer anonymously, no names appeared on it. However, when the children returned the questionnaires to school, they were asked to write their names on the envelopes containing the questionnaires. Each child was then given a number, and each questionnaire was similarly marked so that comparisons could be made.

CHAPTER IV

ANALYSIS OF THE SURVEY DATA

This analysis will be presented in two parts. Part A will measure the effectiveness of an effort to: (1) educate adults in the understanding of the problems of teaching third year arithmetic, and (2) teach adults to supplement the help and attention children receive at school. This will be done by comparing the achievement levels of experimental and control groups of children in the four Flint elementary schools. Part B will seek to: (1) relate the degree of success of the parents of the children in the experimental groups to a variety of factors, including home backgrounds, and (2) evaluate the project from the parents' points of view.

Part A: Report on Achievement Scores of Experimental and Control Groups

A total of 139 families with children enrolled in the third year arithmetic classes in the four Flint schools, during the 1962-63 school year, was selected for this study. The control groups were made up of 304 children who had been

in the same year group or section during the previous two years.

The following 12 tables give the raw analytical data which will be considered in this study. They indicate the sex, I.Q. scores from the Kuhlmann-Anderson test given during the second year, word meaning, paragraph meaning, average reading scores, arithmetic reasoning, arithmetic computation, and average arithmetic scores from the Stanford test given in April of the third year.

The first task in studying a mass of analytical data is to reduce it to a form in which its essential features become apparent and in which it can be compared to similar sets of data. Presumably, the simplest way to obtain a sweeping summary of the figures contained in Tables 1-12 would be to find the achievement mean of the 139 children in the experimental groups and compare them with the achievement mean of the 304 children in the control groups. Such a technique, however, is not applicable here since comparisons of variances between populations in the four schools revealed a lack of homogeneity.

The procedure, then, is to study each school by itself and make comparisons between data gathered from each experimental group and similar data obtained from its accompanying control groups. In the case of School A we can

TABLE 1

EXPERIMENTAL GROUP I, SCHOOL A

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	B	104	6.3	5.7	6.0	5.5	4.9	5.2
2	B	105	4.3	3.7	4.0	4.5	4.9	4.7
3	B	114	7.6	5.4	6.5	5.7	4.6	5.2
4	B	109	6.3	6.5	6.4	4.7	4.9	4.8
5	B	96	5.4	4.5	4.9	4.4	4.7	4.6
6	G	101	4.3	4.3	4.3	4.7	4.8	4.8
7	G	98	5.4	4.7	5.1	4.2	4.3	4.3
8	B	111	5.9	5.7	5.8	5.2	4.8	5.0
9	B	105	5.9	4.7	5.3	5.7	4.7	5.2
10	B	108	4.8	3.9	4.4	4.9	4.5	4.7
11	G	103	4.3	3.5	3.9	5.4	5.3	5.4
12	B	115	4.7	4.9	4.8	4.6	4.8	4.7
13	G	115	5.6	5.7	5.7	5.8	5.3	5.6
14	G	111	4.7	5.7	5.7	5.2	5.0	5.1
15	G	107	5.2	3.8	4.5	5.4	4.9	5.2
16	B	101	3.8	3.8	3.8	4.3	4.8	4.6
17	B	108	8.9	6.5	7.7	6.4	5.1	5.8
18	B	99	4.3	5.4	4.9	4.9	4.8	4.9
19	G	110	4.7	4.5	4.6	4.3	5.0	4.7
20	B	109	4.5	3.8	4.2	5.2	5.0	5.1
21	B	117	5.0	5.0	5.0	5.4	5.1	5.3
22	G	107	5.2	4.3	4.8	4.7	4.7	4.7

TABLE 1--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	B	113	6.1	5.0	5.6	5.4	4.3	4.9
24	G	104	4.8	4.3	4.6	5.1	4.9	5.0
25	G	109	5.2	5.0	5.1	4.9	5.2	4.6
26	G	113	5.0	4.7	4.9	5.7	4.8	5.3
27	G	112	4.3	5.0	4.7	5.2	4.6	4.9
28	G	113	3.5	3.8	3.7	5.1	4.6	4.9
29	G	108	4.8	3.8	4.2	4.8	4.5	4.7
30	B	106	4.8	4.4	4.6	5.5	4.3	4.9
31	G	117	3.4	3.9	3.7	4.3	4.9	4.6
32	B	109	5.0	4.7	4.9	5.5	4.8	5.2
33	G	94	3.0	2.6	2.8	2.2	3.8	3.0
34	B	106	3.9	2.5	3.2	4.6	4.8	4.7
35	G	125	3.8	4.3	4.1	4.8	4.7	4.8
36	B	98	3.2	2.6	2.9	3.8	3.7	3.8
37	B	102	3.5	2.9	3.2	3.8	4.4	4.1
38	B	106	2.5	2.3	2.4	2.9	4.1	3.5
39	B	98	3.8	2.9	3.9	4.2	4.6	4.4
40	G	105	4.8	3.1	3.9	4.0	4.1	4.1
41	G	102	2.9	2.6	2.8	2.6	3.9	3.3
42	G	102	4.3	3.3	3.8	5.1	5.1	5.1
43	B	101	3.5	2.7	3.1	3.9	5.0	4.5
44	B	105	4.2	2.4	3.3	3.7	4.5	4.1

TABLE 1--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
45	B	99	4.3	3.6	4.0	4.5	5.0	4.8
46	G	108	4.1	2.9	3.5	4.7	3.9	4.3
47	G	112	2.7	3.3	3.0	3.9	4.6	4.3
48	G	108	2.8	2.1	2.5	3.5	4.1	3.8
49	G	101	3.5	3.3	3.4	4.7	4.8	4.8
50	G	106	2.4	2.1	2.3	3.8	3.8	3.8
51	G	116	4.3	3.2	3.7	4.0	4.9	4.5
52	B	100	2.9	3.2	3.1	4.0	4.1	4.1
53	B	102	3.1	2.9	3.0	2.6	3.7	3.2
54	G	111	3.9	3.2	3.6	4.2	4.6	4.4
55	G	101	4.5	3.1	3.8	5.2	4.5	4.9
56	G	100	3.8	3.6	3.7	4.0	4.5	4.3
57	B	109	3.2	2.5	2.9	4.0	4.9	4.5
58	B	104	2.3	2.8	2.6	4.2	4.6	4.4
59	B	109	3.7	2.9	3.3	4.4	3.7	4.1
60	B	115	4.2	3.3	3.8	4.2	4.4	4.3
61	B	109	3.0	2.7	2.9	4.7	4.6	4.7

TABLE 2

CONTROL GROUP I, SCHOOL A

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	112	5.9	5.3	5.6	5.4	5.1	5.3
2	G	123	4.4	3.9	4.7	4.4	4.4	4.4
3	G	113	4.0	4.4	4.2	4.0	3.7	3.9
4	B	118	4.8	4.7	4.8	6.0	4.8	5.4
5	B	114	4.4	5.6	5.0	4.4	4.1	4.3
6	G	114	5.0	4.7	4.9	4.9	4.4	4.7
7	G	118	5.9	4.2	5.1	5.0	4.3	4.7
8	G	126	5.9	5.0	5.5	4.6	4.5	4.6
9	B	107	6.8	5.3	6.1	4.5	4.1	4.3
10	G	98	5.3	5.0	5.2	4.1	4.2	4.2
11	B	114	4.8	5.3	5.1	4.4	4.3	4.4
12	B	106	4.8	5.0	4.9	4.8	5.0	4.9
13	G	103	5.6	5.3	5.5	3.5	2.8	3.2
14	B	112	4.3	3.9	4.1	3.9	4.0	4.0
15	G	113	6.3	4.2	5.3	5.0	4.7	4.9
16	G	101	4.4	4.7	4.6	4.1	4.3	4.2
17	G	113	7.4	7.0	7.2	5.4	4.8	5.1
18	B	99	7.4	5.3	6.4	4.9	5.0	5.0
19	B	108	4.6	5.3	4.9	4.9	4.8	4.9
20	B	109	5.0	4.4	4.7	4.1	4.2	4.2
21	B	113	4.4	4.2	4.3	4.8	4.4	4.6
22	B	117	3.8	5.0	4.4	3.2	4.5	3.9

TABLE 2--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	G	109	5.3	5.6	5.5	4.5	4.4	4.5
24	B	102	5.0	4.4	4.7	5.2	4.5	4.9
25	B	113	3.8	4.7	4.3	6.0	4.8	5.4
26	G	103	5.0	5.3	5.2	4.1	4.3	4.2
27	B	110	4.4	4.4	4.4	4.7	5.0	4.9
28	G	109	5.0	4.4	4.7	4.1	4.0	4.1
29	G	108	3.5	2.8	3.2	3.6	4.0	3.8
30	B	105	2.5	2.6	2.6	3.3	3.6	3.5
31	B	107	2.3	2.7	2.5	3.0	3.4	3.2
32	B	88	2.3	2.4	2.4	2.0	2.9	2.5
33	B	92	3.3	2.2	2.8	2.8	3.8	3.3
34	B	98	2.1	2.0	2.1	2.3	3.8	3.1
35	B	93	2.2	2.3	2.3	3.3	3.7	3.5
36	G	98	4.1	3.5	3.8	3.7	4.2	3.9
37	B	93	3.3	2.2	2.8	2.5	3.6	3.1
38	G	94	2.9	2.5	2.7	4.0	3.7	3.9
39	G	112	3.7	3.9	3.8	4.6	3.8	4.2
40	B	89	2.9	2.2	2.6	2.9	3.4	3.2
41	B	115	4.3	3.5	3.9	4.0	3.9	4.0
42	B	86	2.6	3.1	2.9	2.6	3.1	2.9
43	B	91	3.0	2.9	3.0	3.1	3.3	3.2
44	G	101	3.4	2.6	3.0	3.1	3.8	3.5

TABLE 2--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
45	G	97	4.1	3.1	3.6	4.4	3.3	3.9
46	B	101	2.6	2.8	2.7	3.5	4.2	3.9
47	B	97	2.0	1.8	1.9	2.6	2.8	2.7
48	G	101	3.3	3.5	3.4	3.8	4.0	3.9
49	G	96	2.3	1.9	2.2	2.3	3.1	2.7
50	B	103	3.1	2.8	3.0	4.4	4.0	4.2
51	B	104	1.5	2.2	1.9	2.8	2.8	2.8
52	B	106	2.6	2.2	2.4	3.8	4.2	4.0
53	G	106	3.7	3.6	3.7	4.7	4.3	4.5
54	B	101	2.4	2.6	2.5	3.8	4.3	4.1
55	G	89	2.6	2.2	2.4	2.2	2.3	2.3
56	G	108	3.4	3.0	3.2	3.3	3.6	3.5
57	B	104	3.8	3.8	3.8	5.2	5.0	5.1
58	B	104	2.0	2.2	2.1	1.9	3.8	2.9
59	G	100	4.0	4.0	4.0	3.1	3.2	3.2
60	B	106	3.7	3.5	3.6	4.9	4.3	4.6
61	B	101	2.4	2.6	2.5	3.6	3.7	3.7

TABLE 3

CONTROL GROUP II, SCHOOL A

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	111	8.4	6.0	7.2	5.0	4.7	4.9
2	B	110	4.7	4.3	4.5	4.7	4.4	4.6
3	B	115	4.7	4.7	4.7	5.6	4.1	4.9
4	G	105	5.2	5.2	5.2	4.1	4.1	4.1
5	B	102	4.1	4.0	4.1	3.7	4.2	3.9
6	G	107	5.2	4.4	4.8	4.7	4.1	4.4
7	G	105	3.9	4.1	4.0	3.3	4.1	3.7
8	G	107	4.7	5.0	4.9	4.8	4.2	4.5
9	G	107	6.2	5.0	5.6	4.5	3.8	4.2
10	B	123	4.9	5.2	5.1	5.6	4.7	5.2
11	G	112	5.2	5.2	5.2	4.8	4.2	4.5
12	G	123	5.8	6.0	5.9	6.1	4.0	5.1
13	G	113	5.5	5.0	5.3	6.9	4.4	5.4
14	B	110	4.4	3.5	3.9	4.5	4.1	4.3
15	G	105	4.9	4.7	4.8	3.9	3.5	3.7
16	B	114	4.9	5.6	5.3	6.1	4.8	5.5
17	B	118	5.5	5.6	5.6	6.1	4.8	5.5
18	G	108	9.7	6.7	8.2	5.6	5.0	5.3
19	B	106	5.5	4.7	5.1	4.5	4.2	4.4
20	B	117	5.8	6.0	5.9	6.1	4.8	5.5
21	B	115	4.5	4.3	4.4	4.8	3.9	4.4
22	B	115	4.5	4.7	4.6	5.6	4.8	5.2

TABLE 3--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	G	102	5.2	5.2	5.2	4.4	4.1	4.3
24	G	124	6.2	5.0	5.6	5.8	4.8	5.3
25	G	103	6.2	4.3	5.3	4.7	4.0	4.4
26	B	112	5.2	5.2	5.2	5.0	4.7	4.9
27	B	113	4.2	4.0	4.1	4.7	3.7	4.4
28	G	103	4.5	5.6	5.1	4.5	3.6	4.1
29	B	107	2.9	2.9	2.9	1.7	3.3	2.5
30	G	98	2.8	2.4	2.6	3.0	3.1	3.1
31	B	97	3.9	3.4	3.7	3.7	3.4	3.6
32	B	78	2.7	3.0	2.9	2.5	3.1	2.8
33	G	104	2.5	1.7	2.1	2.8	3.6	3.2
34	B	102	4.9	4.7	4.8	3.7	3.1	3.4
35	G	91	3.5	3.2	3.4	3.0	3.0	3.0
36	G	101	3.9	2.2	3.1	3.6	3.6	3.6
37	B	102	3.3	3.4	3.2	3.9	3.0	3.5
38	B	95	3.8	3.0	3.4	3.3	3.4	3.4
39	B	111	2.7	3.4	3.2	5.0	3.4	4.2
40	G	115	3.7	3.9	3.8	2.8	3.7	3.3
41	G	102	3.4	3.1	3.3	2.7	3.0	2.9
42	G	112	3.2	2.5	2.9	3.1	3.7	3.4
43	B	95	2.9	2.7	2.8	2.9	2.7	2.8
44	B	109	2.8	2.8	2.8	3.3	2.8	3.1

TABLE 3--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
45	B	110	4.3	3.5	3.9	4.3	3.4	3.9
46	G	91	2.8	3.6	3.2	3.6	3.1	3.4
47	B	99	3.7	3.3	3.5	3.1	2.9	3.0
48	G	96	3.9	4.0	4.0	3.7	3.4	3.6
49	G	102	4.2	3.4	3.8	3.7	3.3	3.5
50	G	105	3.4	3.4	3.4	3.6	3.4	3.5
51	B	112	3.7	5.0	4.4	3.6	2.9	3.3
52	B	94	2.6	2.6	2.6	2.1	2.9	2.5
53	G	89	3.4	3.2	3.3	4.0	3.1	3.6
54	G	86	3.7	3.0	3.4	3.3	2.9	3.1
55	G	97	2.8	2.9	2.9	3.1	2.4	2.8
56	G	98	3.2	3.0	3.1	3.1	2.2	2.7
57	B	106	3.0	2.5	2.8	2.6	3.5	3.1
58	G	102	3.3	3.5	3.4	3.2	2.5	2.9
59	B	117	5.2	4.7	5.0	4.1	3.1	3.6

TABLE 4

EXPERIMENTAL GROUP I, SCHOOL B

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	B	92	3.3	2.7	3.0	4.3	4.5	4.4
2	B	98	2.7	2.6	2.7	3.8	3.8	3.8
3	G	110	3.8	3.8	3.8	4.6	4.1	4.4
4	B	100	3.5	2.9	3.2	4.0	4.3	4.2
5	G	101	2.9	3.1	3.0	4.3	4.4	4.4
6	B	98	3.0	3.1	3.1	4.0	4.2	4.1
7	B	106	4.5	3.5	4.0	4.7	4.4	4.6
8	B	113	4.3	3.1	3.7	4.6	5.0	4.8
9	B	98	3.2	2.5	2.9	4.5	4.6	4.6
10	B	105	3.5	4.4	4.0	4.6	4.3	4.5
11	B	91	2.9	2.7	2.8	4.0	3.6	3.8
12	G	104	3.5	3.1	3.3	4.2	4.2	4.2
13	B	107	4.2	3.9	4.1	4.3	4.4	4.4
14	G	105	3.6	3.7	3.7	4.5	4.2	4.4
15	G	100	3.6	3.5	3.6	4.6	4.4	4.5
16	G	95	2.9	3.0	3.0	3.9	4.1	4.0
17	B	96	2.6	3.0	2.8	4.1	4.5	4.3
18	G	97	4.1	3.4	3.8	4.4	4.7	4.6
19	G	109	2.5	2.8	2.7	4.1	4.5	4.3
20	B	100	2.6	2.9	2.8	4.1	4.6	4.4
21	B	108	5.4	4.7	5.1	4.9	4.4	4.7
22	B	107	3.6	3.0	3.3	5.1	4.8	5.0

TABLE 4--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	G	111	3.6	3.2	3.4	5.5	5.4	5.5
24	G	112	2.5	2.7	2.6	3.6	4.7	4.2
25	G	114	4.5	4.1	4.3	4.4	4.6	4.5
26	B	109	4.2	3.3	3.8	4.6	4.9	4.8
27	G	87	3.5	3.7	3.6	3.8	3.3	3.6

TABLE 5

CONTROL GROUP I, SCHOOL B

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	B	94	3.0	2.8	2.9	2.9	3.9	3.4
2	B	99	3.8	4.7	4.3	4.7	4.7	4.7
3	B	98	5.9	4.7	5.3	4.8	5.0	4.9
4	G	100	4.8	5.0	4.9	4.3	4.4	4.4
5	G	103	3.7	3.1	3.4	4.6	4.7	4.7
6	B	101	4.3	4.4	4.4	4.7	4.3	4.5
7	G	103	3.1	3.5	3.3	4.4	4.5	4.5
8	B	101	6.8	6.5	6.7	5.4	4.7	5.1
9	G	100	3.4	3.8	3.6	4.6	4.3	4.5
10	B	90	2.5	2.2	2.4	3.6	2.7	3.2
11	B	102	2.3	2.6	2.5	3.8	4.4	4.1
12	G	100	3.8	5.3	4.1	4.4	4.4	4.4
13	G	95	3.8	2.9	3.4	3.5	4.5	4.0
14	G	103	5.6	5.6	5.6	4.8	4.8	4.8
15	G	102	5.6	5.3	5.5	5.8	4.6	5.2
16	B	102	3.5	3.1	3.3	3.8	4.2	4.0
17	B	96	2.7	3.2	3.0	3.1	4.3	3.7
18	B	93	3.1	3.1	3.1	5.3	4.4	4.9
19	G	97	3.1	3.2	3.2	3.9	3.7	3.8
20	B	98	4.8	3.7	4.3	4.4	4.1	4.3
21	G	104	4.6	4.4	4.5	4.3	4.3	4.3
22	G	92	3.0	2.8	2.9	3.3	3.9	3.6

TABLE 5--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	B	82	2.5	2.5	2.5	2.2	4.0	3.1
24	B	100	3.0	3.0	3.0	4.3	4.1	4.2
25	B	97	2.4	2.0	2.2	2.3	2.9	2.6
26	B	101	3.5	3.6	3.6	4.8	4.7	4.8
27	G	97	2.7	3.2	2.9	3.7	3.9	3.8
28	G	102	3.5	3.3	3.4	3.4	2.6	3.0
29	B	103	3.3	3.0	3.2	3.1	2.7	2.9
30	G	96	3.6	3.9	3.8	3.8	3.4	3.6
31	B	91	2.9	3.2	3.1	3.7	3.0	3.4
32	G	100	3.1	2.6	2.9	3.2	2.8	3.0
33	G	95	5.6	3.9	4.8	3.2	3.4	3.3
34	G	100	4.1	4.1	4.1	4.0	3.3	3.7
35	B	94	4.1	4.7	4.4	4.4	4.3	4.4
36	B	104	2.9	3.3	3.1	4.1	3.0	3.6

TABLE 6

CONTROL GROUP II, SCHOOL B

No.	Sex	IQ	Par. Mean.	Word. Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	112	9.3	6.6	8.0	5.6	4.6	5.1
2	G	102	5.5	5.0	5.3	4.8	4.2	4.5
3	G	102	4.0	3.9	4.0	4.0	3.4	3.7
4	B	84	3.3	2.8	3.1	3.8	3.4	3.6
5	B	98	4.1	4.4	4.3	3.6	3.0	3.6
6	B	99	3.4	2.8	3.1	3.6	3.6	3.6
7	G	88	3.6	3.6	3.6	3.9	3.6	3.8
8	G	99	4.0	5.1	4.6	4.4	4.3	4.4
9	B	98	3.8	4.1	4.0	3.0	2.9	3.0
10	B	87	2.4	2.4	2.4	3.1	3.2	3.2
11	G	100	5.0	4.4	4.7	4.4	3.7	4.1
12	B	96	1.8	1.4	1.6	2.3	3.3	2.8
13	G	99	2.3	2.7	2.5	2.3	3.1	2.7
14	G	100	1.6	1.6	1.6	1.7	2.6	2.2
15	B	85	2.1	2.4	2.3	2.2	2.6	2.4
16	B	93	2.8	3.6	3.2	4.0	2.9	3.5
17	G	88	2.9	3.2	3.1	2.5	3.0	2.8
18	B	101	3.3	3.3	3.3	4.4	3.8	4.1
19	B	99	4.4	3.9	4.2	4.6	3.3	4.0
20	G	102	4.4	4.2	4.3	4.7	3.8	4.3
21	G	92	3.1	2.7	2.9	3.8	3.8	3.8
22	B	95	4.3	3.1	3.7	3.4	3.4	3.4

TABLE 6--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	B	94	4.2	3.3	3.8	3.6	3.0	3.3
24	G	85	2.6	2.3	2.5	2.0	2.8	2.4
25	G	101	4.2	4.6	4.4	4.6	4.4	4.5
26	G	91	3.5	2.2	2.9	3.3	2.8	3.1
27	B	93	3.8	2.9	3.4	2.3	2.6	2.5
28	G	89	4.2	3.6	3.9	3.6	2.8	3.2
29	B	94	4.1	3.8	4.0	3.1	3.1	3.1
30	B	100	3.1	3.2	3.2	3.3	3.7	3.5
31	G	99	3.9	4.3	4.1	4.7	3.6	4.2
32	G	92	2.9	2.9	2.9	3.4	3.2	3.3
33	B	96	3.2	3.8	3.5	2.8	3.4	3.1
34	G	99	3.6	2.9	3.3	3.8	3.0	3.4
35	B	89	4.2	4.1	4.2	4.4	4.7	4.6
36	G	101	3.5	3.8	3.7	4.5	3.7	4.1

TABLE 7

EXPERIMENTAL GROUP I, SCHOOL C

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	94	4.8	4.3	4.6	5.4	4.9	5.2
2	B	132	3.6	4.1	3.9	5.4	4.7	5.1
3	B	99	6.1	4.7	5.4	5.7	5.1	5.4
4	G	103	3.7	3.4	3.6	4.9	5.3	5.1
5	G	103	5.2	4.4	4.8	5.8	5.2	5.5
6	B	107	7.1	3.8	5.5	5.5	5.0	5.3
7	G	109	6.1	4.1	5.1	5.7	4.5	5.1
8	G	98	4.2	4.3	4.3	5.2	4.9	5.1
9	G	99	5.6	5.0	5.3	5.7	5.1	5.4
10	B	97	2.0	2.5	2.3	2.4	2.7	2.6
11	B	85	3.4	3.5	3.5	5.8	5.0	5.4
12	G	85	2.6	2.9	2.8	4.4	4.8	4.6
13	B	95	3.5	3.8	3.7	4.9	4.2	4.6
14	B	96	5.4	4.5	5.0	5.5	4.7	5.1
15	G	97	2.7	2.7	2.7	5.1	4.3	4.7
16	G	105	4.7	3.8	4.3	6.0	5.1	5.6
17	G	109	8.4	5.0	6.7	5.7	4.7	5.2
18	G	103	3.8	3.6	3.7	4.4	4.1	4.3
19	G	88	3.4	3.3	3.4	5.2	4.7	6.0
20	G	96	4.5	4.3	4.4	5.7	4.8	5.3
21	B	115	3.9	2.1	3.0	5.4	5.1	5.3
22	B	100	4.8	3.2	4.0	6.2	5.0	5.6

TABLE 8

CONTROL GROUP I, SCHOOL C

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	90	3.8	3.4	3.6	3.2	3.5	3.3
2	B	103	3.9	4.3	4.1	4.5	3.4	4.0
3	B	108	5.2	5.2	5.2	4.1	3.8	4.0
4	G	100	4.2	5.0	4.6	4.1	5.0	4.6
5	G	83	4.2	4.6	4.4	5.0	4.8	4.9
6	G	68	1.6	1.6	1.6	1.9	2.5	2.2
7	B	90	3.1	3.1	3.1	3.7	2.9	3.3
8	G	99	2.0	2.4	2.2	3.0	3.1	3.1
9	B	89	2.4	2.5	2.5	2.6	3.8	3.2
10	B	85	2.9	4.0	3.5	2.7	2.2	2.5
11	B	76	3.4	3.1	3.3	3.5	2.6	3.1
12	B	108	5.0	3.9	4.5	5.2	5.1	5.2
13	B	92	3.6	3.0	3.3	5.8	6.1	6.0
14	G	90	3.5	3.6	3.6	3.9	3.5	3.7
15	G	91	5.2	6.1	5.7	5.0	4.2	4.8
16	B	99	3.8	4.7	4.3	4.0	3.9	4.0
17	G	110	3.7	4.8	4.3	5.4	4.6	5.0
18	G	101	4.5	5.6	5.1	6.9	4.5	5.7
19	G	89	3.8	4.2	4.0	6.0	5.5	5.8
20	G	101	4.7	4.4	4.6	5.0	4.7	4.9
21	B	106	3.3	4.3	3.8	4.8	4.2	4.5
22	G	117	4.7	4.0	4.4	4.4	4.7	4.6

TABLE 8--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	B	98	3.8	3.9	3.9	5.6	4.5	5.1
24	B	103	3.4	3.6	3.5	3.8	5.2	4.5
25	G	102	4.3	4.7	4.5	4.3	4.1	4.2
26	B	107	2.9	3.8	3.4	4.3	3.3	3.8
27	G	77	3.8	3.9	3.9	3.1	2.8	3.0
28	B	89	4.2	4.1	4.2	4.3	3.7	4.0

TABLE 9

CONTROL GROUP II, SCHOOL C

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	85	2.0	2.7	2.4	2.1	2.5	2.3
2	B	107	5.5	5.4	5.5	5.4	4.5	5.0
3	G	93	3.4	3.0	3.2	3.5	3.9	3.7
4	G	103	2.6	2.9	2.8	2.9	3.3	3.1
5	B	94	3.9	3.5	3.7	5.1	4.3	4.7
6	G	101	3.2	3.2	3.2	3.8	3.6	3.7
7	B	85	2.8	3.1	3.0	4.3	4.1	4.2
8	B	76	2.7	2.9	2.8	4.2	4.0	4.1
9	B	104	5.6	6.0	5.8	6.0	4.7	5.4
10	G	106	4.6	3.9	4.3	5.0	5.7	5.4
11	B	101	3.3	4.6	4.0	3.9	3.7	3.8
12	B	79	3.7	2.7	3.2	4.7	4.5	4.6
13	G	98	3.8	3.2	3.5	4.0	3.8	3.9
14	G	102	5.0	5.1	5.1	6.4	5.2	5.8
15	G	93	2.9	3.2	3.1	3.7	3.8	3.8
16	G	102	5.7	5.1	5.4	6.1	5.0	5.6
17	B	99	4.0	3.5	3.8	5.0	4.3	4.7
18	B	90	3.7	3.8	3.8	4.4	4.8	4.6
19	B	103	4.4	3.8	4.1	5.0	4.4	4.7
20	B	95	5.6	6.5	6.1	6.3	5.4	5.9
21	B	97	3.9	4.4	4.2	5.0	3.5	4.3

TABLE 10

EXPERIMENTAL GROUP I, SCHOOL D

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	B	95	3.1	3.2	3.2	4.0	4.3	4.2
2	G	86	2.0	2.3	2.2	3.1	4.1	3.6
3	B	108	3.3	3.1	3.2	5.1	4.5	4.8
4	G	97	3.1	2.9	3.0	3.9	4.1	4.0
5	G	105	2.5	2.4	2.5	4.1	4.6	4.4
6	B	95	3.6	3.5	3.6	4.0	3.9	4.0
7	G	112	4.3	3.8	4.1	4.0	4.5	4.3
8	B	99	1.8	2.3	2.1	2.9	3.5	3.4
9	G	90	2.9	2.8	2.9	4.0	4.4	4.2
10	B	94	2.8	2.9	2.9	3.3	3.3	3.3
11	B	89	2.4	2.3	2.4	3.4	4.1	3.8
12	B	107	3.2	2.6	2.9	3.3	3.6	3.5
13	G	101	3.8	3.3	3.6	4.1	4.5	4.3
14	G	92	2.6	3.7	3.2	3.3	3.4	3.4
15	G	115	3.9	2.9	3.4	4.5	5.1	4.8
16	B	89	2.1	1.8	2.0	3.9	4.6	4.3
17	B	101	3.1	3.2	3.2	4.0	4.1	4.1
18	G	93	3.0	2.8	2.9	3.4	4.1	3.8
19	B	94	2.5	3.0	2.8	4.2	4.4	4.3
20	B	97	3.4	3.4	3.4	3.9	4.0	4.0
21	B	75	3.3	2.7	3.0	2.9	3.2	3.1
22	B	81	2.3	2.7	2.3	2.1	2.5	2.3

TABLE 10--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	G	103	3.7	3.4	3.6	4.5	4.1	4.3
24	B	92	2.6	2.1	2.4	3.2	4.3	3.8
25	G	77	2.2	2.1	2.2	2.6	2.5	2.6
26	G	107	4.7	3.3	4.0	4.7	4.5	4.6
27	G	85	2.3	2.5	2.4	2.1	3.3	2.7
28	B	91	3.5	2.5	3.0	3.7	3.0	3.4
29	B	109	3.7	3.2	3.5	4.9	4.9	4.9

TABLE 11

CONTROL GROUP I, SCHOOL D

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	G	102	2.8	2.6	2.7	3.2	3.5	3.4
2	B	99	3.0	2.8	2.9	4.1	4.1	4.1
3	B	102	2.9	2.8	2.9	3.5	3.4	3.5
4	G	102	3.6	2.8	3.2	3.8	4.0	3.9
5	G	97	2.1	2.1	2.1	2.7	4.3	3.5
6	G	112	4.0	3.8	3.9	3.8	4.1	4.0
7	B	100	2.9	3.6	3.3	3.9	3.5	3.7
8	B	93	2.7	2.6	2.7	3.4	4.1	3.8
9	G	102	3.5	3.9	3.7	3.7	4.1	3.9
10	G	106	4.0	3.9	4.0	4.6	4.4	4.5
11	B	88	2.5	2.3	2.4	3.2	4.2	3.7
12	G	111	2.7	2.7	2.7	3.3	4.2	3.8
13	B	86	2.4	2.3	2.4	3.3	3.3	3.3
14	B	101	2.8	3.3	3.1	4.3	4.1	4.2
15	B	91	3.4	2.9	3.2	4.1	3.8	4.0
16	G	94	1.7	2.2	2.0	3.2	3.3	3.3
17	G	107	4.4	3.2	3.8	4.3	3.8	4.1
18	B	82	1.8	2.6	2.2	3.8	3.8	3.8
19	B	103	3.5	3.2	3.4	3.8	3.7	3.8
20	G	107	3.8	3.1	3.5	3.9	4.1	4.0
21	G	88	2.2	1.9	2.1	1.9	2.3	2.1
22	B	96	2.2	2.6	2.4	3.1	3.5	3.3

TABLE 11--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	G	82	2.7	2.3	2.5	1.7	2.3	2.0
24	G	102	3.8	3.2	3.5	3.8	3.9	3.9
25	B	96	2.4	2.8	2.6	3.3	3.1	3.2
26	B	93	2.7	2.8	2.8	3.9	4.0	4.0
27	G	96	2.2	2.0	2.1	2.9	4.4	3.7
28	G	96	2.6	2.4	2.5	3.4	3.9	3.7
29	B	97	2.7	2.5	2.6	2.7	3.5	3.1
30	B	90	2.8	3.3	3.1	3.4	3.9	3.7

TABLE 12

CONTROL GROUP II, SCHOOL D

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
1	B	76	3.3	2.8	3.1	3.4	3.2	3.3
2	B	74	3.5	2.7	3.1	2.6	3.2	2.9
3	G	86	2.9	2.9	2.9	3.6	3.6	3.6
4	B	82	3.2	2.9	3.1	3.4	3.7	3.6
5	G	101	3.6	3.5	3.6	3.7	3.7	3.7
6	G	99	5.2	4.3	4.8	4.4	3.4	3.9
7	B	110	4.0	4.2	4.1	5.0	4.3	4.7
8	G	109	4.6	4.6	4.6	4.6	3.9	4.3
9	B	98	4.0	2.9	3.5	4.2	3.9	4.1
10	B	103	2.9	3.9	3.4	4.4	3.4	3.9
11	B	105	3.6	3.6	3.6	4.0	4.0	4.0
12	G	100	4.2	2.8	3.5	3.9	3.8	3.9
13	B	96	3.8	4.0	3.9	3.6	3.8	3.7
14	G	108	3.5	2.8	3.2	4.4	3.7	4.1
15	G	105	6.0	3.1	4.6	4.6	3.7	4.2
16	B	99	3.6	2.8	3.7	3.6	3.1	3.4
17	G	101	3.2	2.7	3.1	3.4	3.7	3.6
18	G	103	3.7	2.9	3.3	3.4	3.4	3.4
19	B	104	4.0	3.3	3.7	3.6	3.8	3.7
20	G	101	3.5	3.8	3.7	4.4	3.6	4.0
21	B	98	3.2	3.2	3.2	3.7	3.7	3.7
22	G	98	3.8	3.1	3.5	3.6	3.0	3.3

TABLE 12--Continued

No.	Sex	IQ	Par. Mean.	Word Mean.	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
23	G	86	3.1	2.4	2.8	2.5	2.6	2.6
24	B	87	4.3	4.1	4.2	3.4	3.3	3.4
25	G	99	2.8	2.6	2.7	2.5	3.6	3.1
26	B	84	2.5	2.6	2.6	1.5	3.1	2.4
27	B	102	3.9	3.0	3.5	3.7	3.8	3.8
28	G	97	4.0	2.4	3.5	4.8	3.8	4.3
29	B	107	3.3	2.9	3.1	3.8	3.8	3.8
30	G	99	4.6	3.3	3.9	3.7	3.7	3.7
31	G	109	4.0	4.1	4.1	4.4	4.0	4.2
32	G	104	3.6	3.8	3.7	4.5	3.7	4.1
33	G	90	2.8	2.4	2.6	3.9	4.0	4.0

quickly draw conclusions from mean figures compiled from various factors in Tables 1-12. These mean figures are shown in Table 13. (It should be remembered that of the four schools in this experiment, School A had two sections of classes which were exposed to the Experimental Arithmetic Project and that each experimental group had two control groups).

The sex factor has not been included in Table 13 and will be excluded from all further analysis since no significant difference was found between the achievement levels of boys and girls in School A or in the three other schools. The researcher realizes the lack of significance in this factor is unusual since boys generally are superior to girls in arithmetic skills.[1] The reasons for this can only be speculative and will be discussed in the conclusions.

Other statistics in Table 13, however, are of high interest. For example, differences in intelligence quotients and reading averages are so slight that at no acceptable level are they significant. This tends all the more to throw light on the importance of the wide divergence between the arithmetic means of the experimental and control

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[1]Chester and Edith Harris, Encylopedia of Educational Research (3rd ed.; New York: MacMillan Company, 1960), p. 685.

TABLE 13

MEAN SCORES - SCHOOL A

	No. of Students	Mean IQ	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
Control Group I	61	105	3.9	3.9	4.0	4.0
Control Group II	59	106	4.2	4.1	3.7	4.0
Total Control Groups	120	105	4.0	4.0	3.8	4.0
Experimental Group	61	107	4.1	4.6	4.6	4.6

groups. Since the Stanford Achievement test was given in April of the third year and since a level of 3.8 (three years and eight months) would thus be considered "par for the course," the progress of Experimental Group I might be considered dramatic. Experimental Group I attained an arithmetic average of 4.6, revealing a gain of eight months above the normal figure. It also reveals a gain of seven months over the combined control groups.

The following three graphs were constructed to provide another and more graphic perspective of the differences in arithmetic achievement made by experimental and control groups. In the construction of these graphs the researcher followed the suggestion of Wallis and Roberts in selecting the grade level score of each pupil to the nearest year of achievement.[1] Thus, an achievement level of 4.8 was translated as 5; a level of 4.2 was translated as 4. In cases of even halves, the lower grade was selected for "even-and-a-half" numbers; the higher grade for "odd-and-a-half numbers. Thus:

2.5 = 2.0

3.5 = 4.0

4.5 = 4.0

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[1]W. Allen Wallis and Harry V. Roberts, Statistics, A New Approach (Brooklyn, New York: The Free Press of Glencoe, Inc., 1956), p. 175.

5.5 = 6.0

The graphs show the percentage of children scoring at different grade levels and separate colors on the graphs illustrate differences in arithmetic and reading achievement. To avoid unnecessary detail, both experimental groups of School A were combined in one graph, and the two control groups for each preceding year were likewise combined.

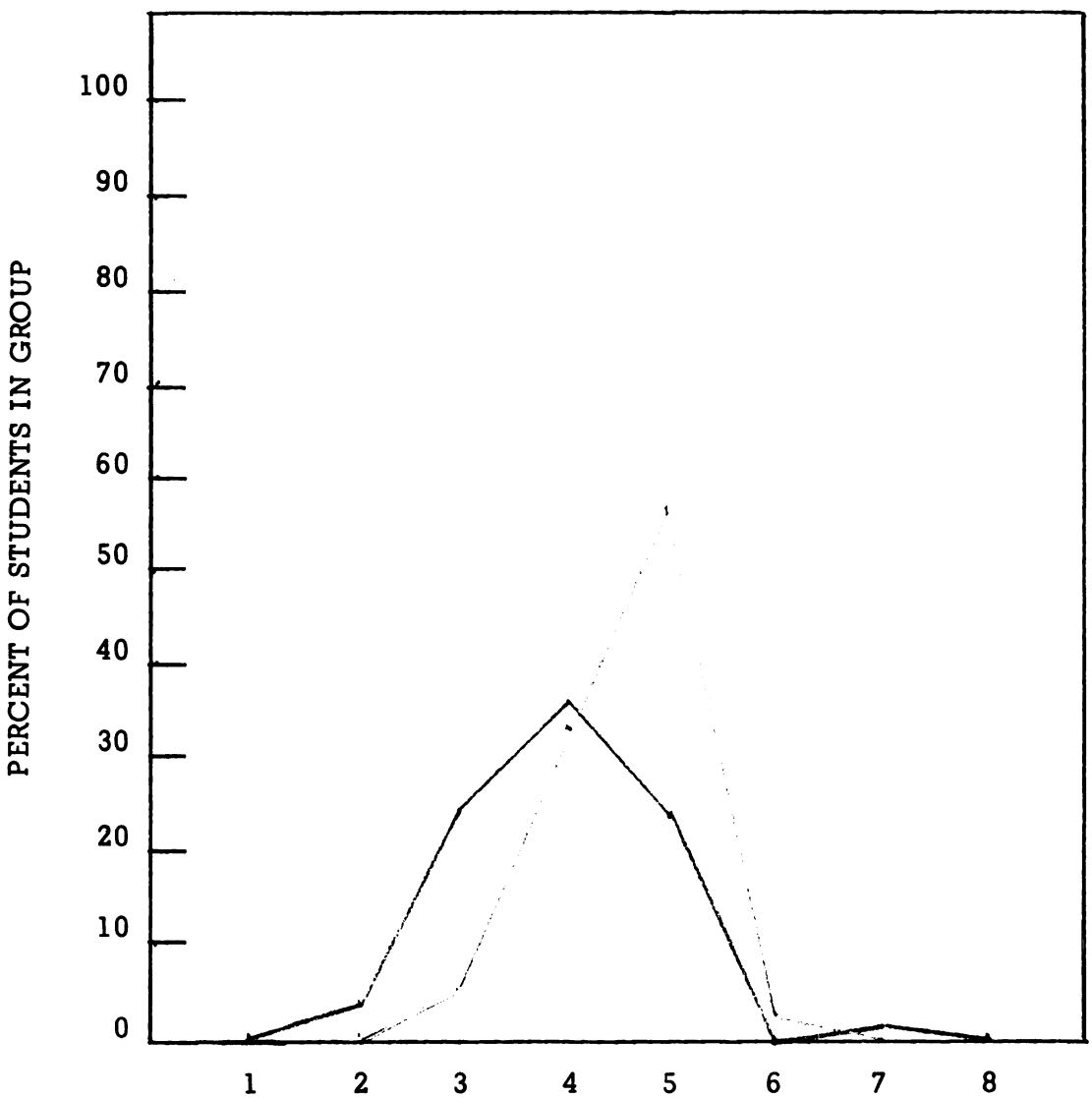
Graph 1 shows that 57% of the children in the experimental groups in School A achieved an arithmetic score at or close to the fifth grade level and that the next highest percentage group attained a fourth-year level. Only 26% of the children in the control groups of the first preceding year were able to attain the fifth-year level while the greater percentage group fell into the fourth-year category. The second control groups were able to do no better.

While Graphs 1, 2, and 3 show quite irregular levels for reading achievement, the actual difference in means between combined experimental and combined control groups is a matter of one month--4.1 for the experimental groups and 4.0 for the control groups. As stated, there was no significant difference at an acceptable level for reading achievement.

GRAPH 1

EXPERIMENTAL GROUP I, SCHOOL A

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

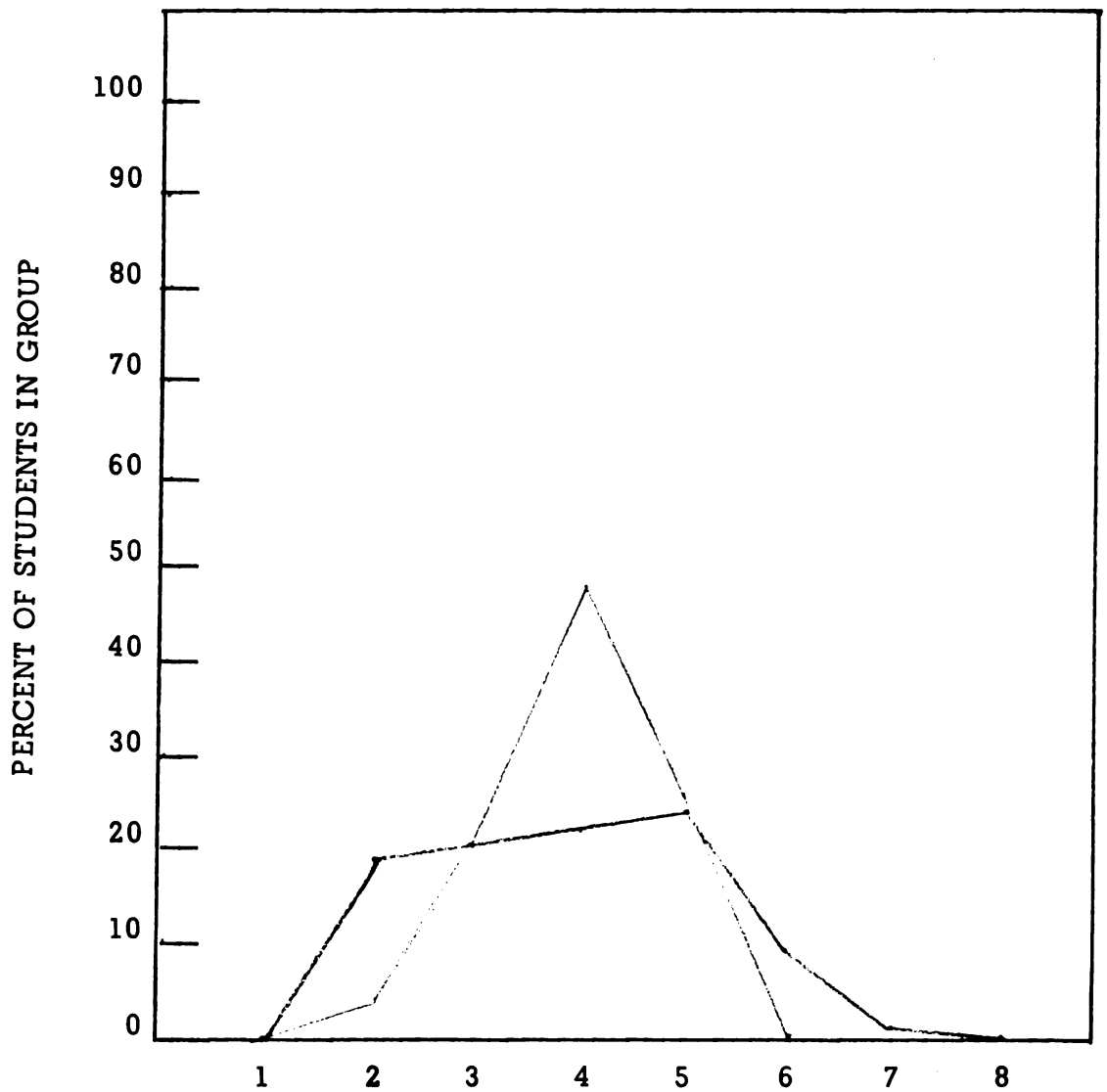


Blue--Reading Average
Red--Arithmetic Average

GRAPH 2

CONTROL GROUP I, SCHOOL A

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

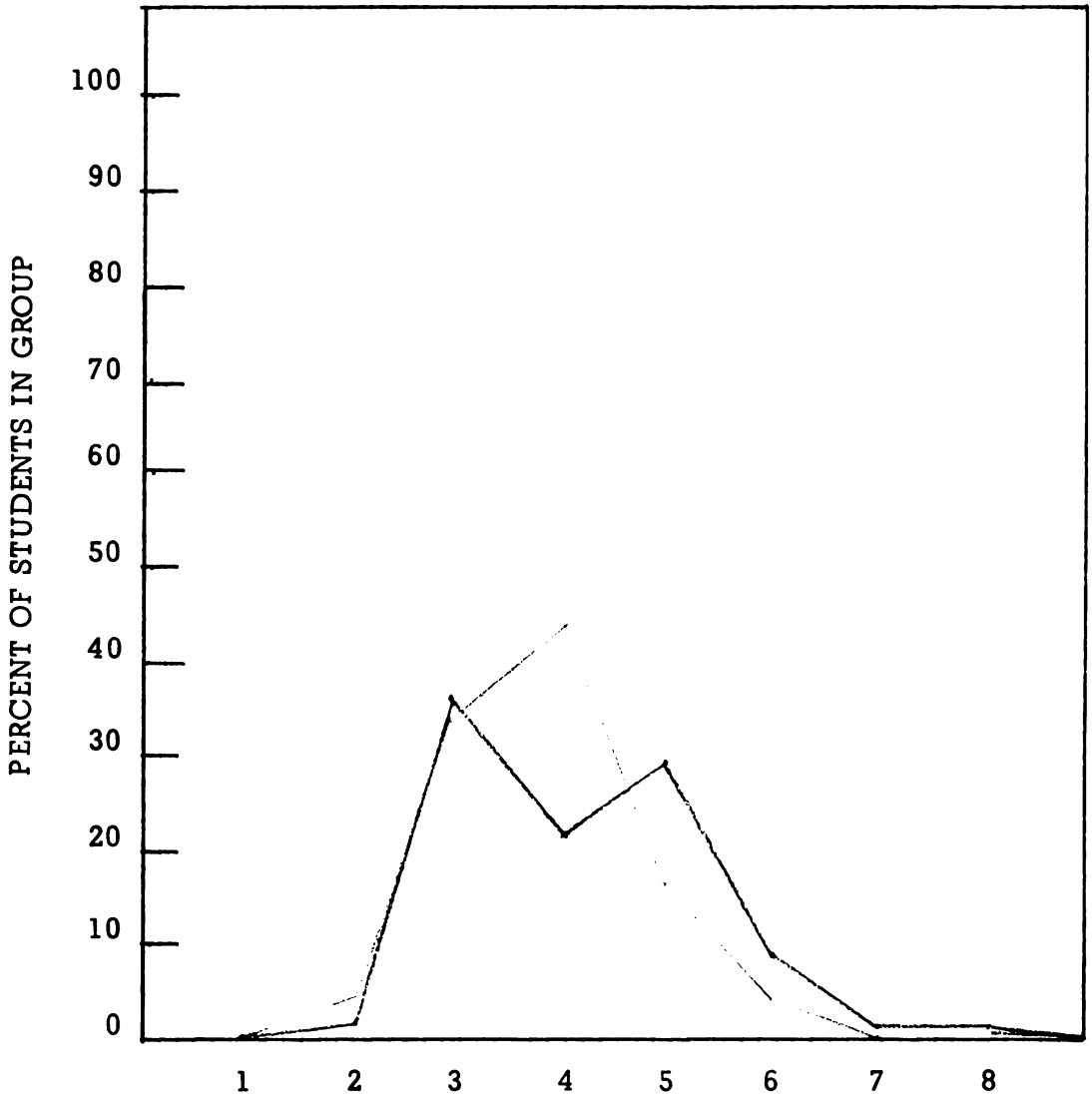


Blue--Reading Average
Red--Arithmetic Average

GRAPH 3

CONTROL GROUP II, SCHOOL A

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES



Blue--Reading Average
Red--Arithmetic Average

The performance of the children in School B can be partially analyzed in Table 14.

Here again we find that the difference in intelligence quotients is too slight to be significant (the T-test score was 4.248). The reading mean of the experimental group is lower than the mean of the control groups. Yet, again we find sizeable discrepancies in arithmetic reasoning, arithmetic computation, and the arithmetic average. The experimental group in this school reached an arithmetic achievement level of 4.4, six months ahead of the mean for the control groups. The T-test score was 5.655, which is highly significant. The fact that the experimental group, compared with the combined control groups, scored lower in reading and higher in arithmetic is an item which cannot be ignored in evaluating the project in this particular school.

Graphic treatment of the performances of children in School B is given in Graphs 4, 5, and 6.

TABLE 14

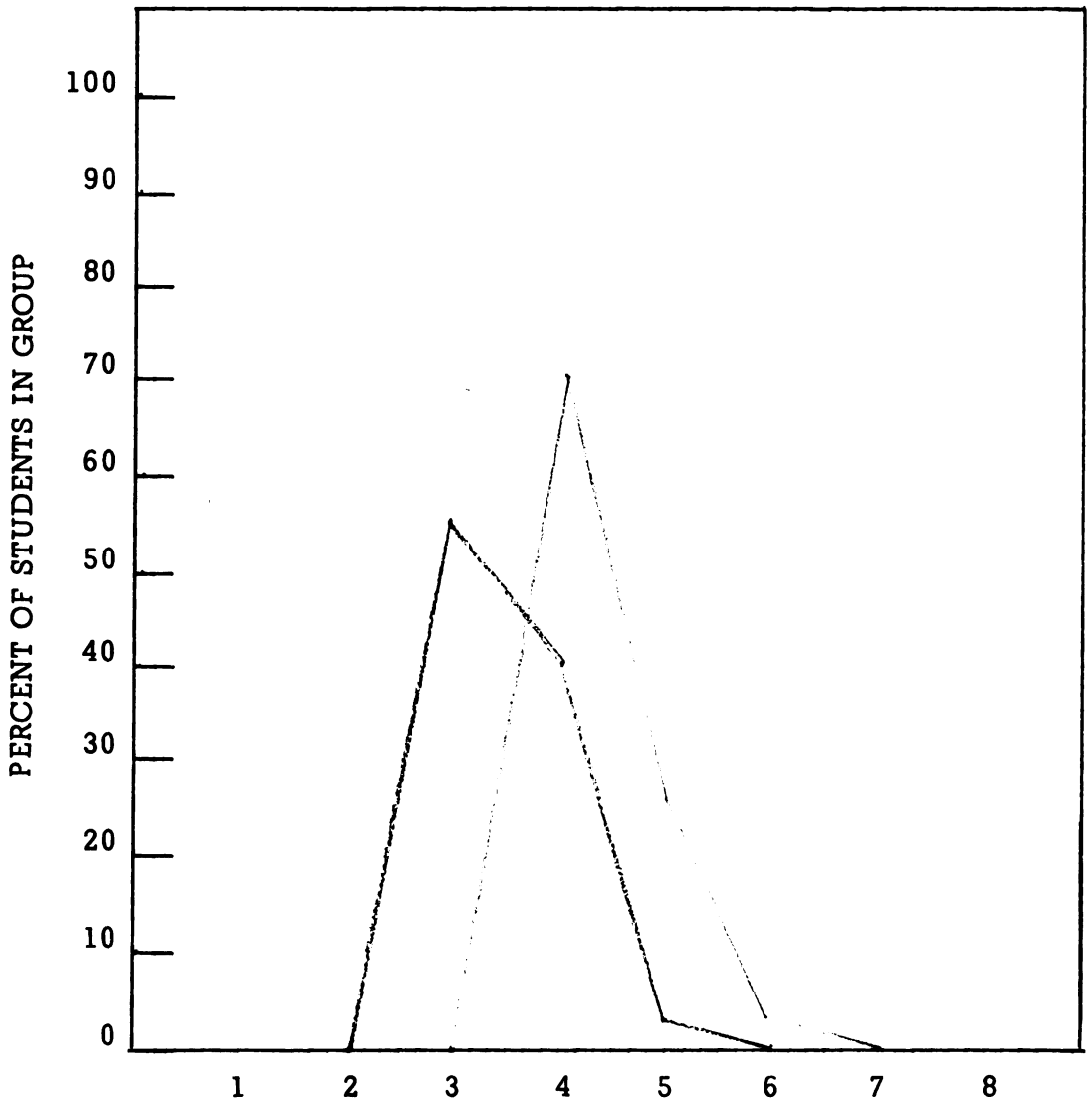
MEAN SCORES - SCHOOL B

	No. of Students	Mean IQ	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
Control Group I	36	98	3.8	4.2	4.0	4.1
Control Group II	36	96	3.6	3.5	3.4	3.5
Total Control Groups	72	97	3.7	3.8	3.7	3.8
Experimental Group	27	103	3.4	4.4	4.4	4.4

GRAPH 4

EXPERIMENTAL GROUP I, SCHOOL B

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

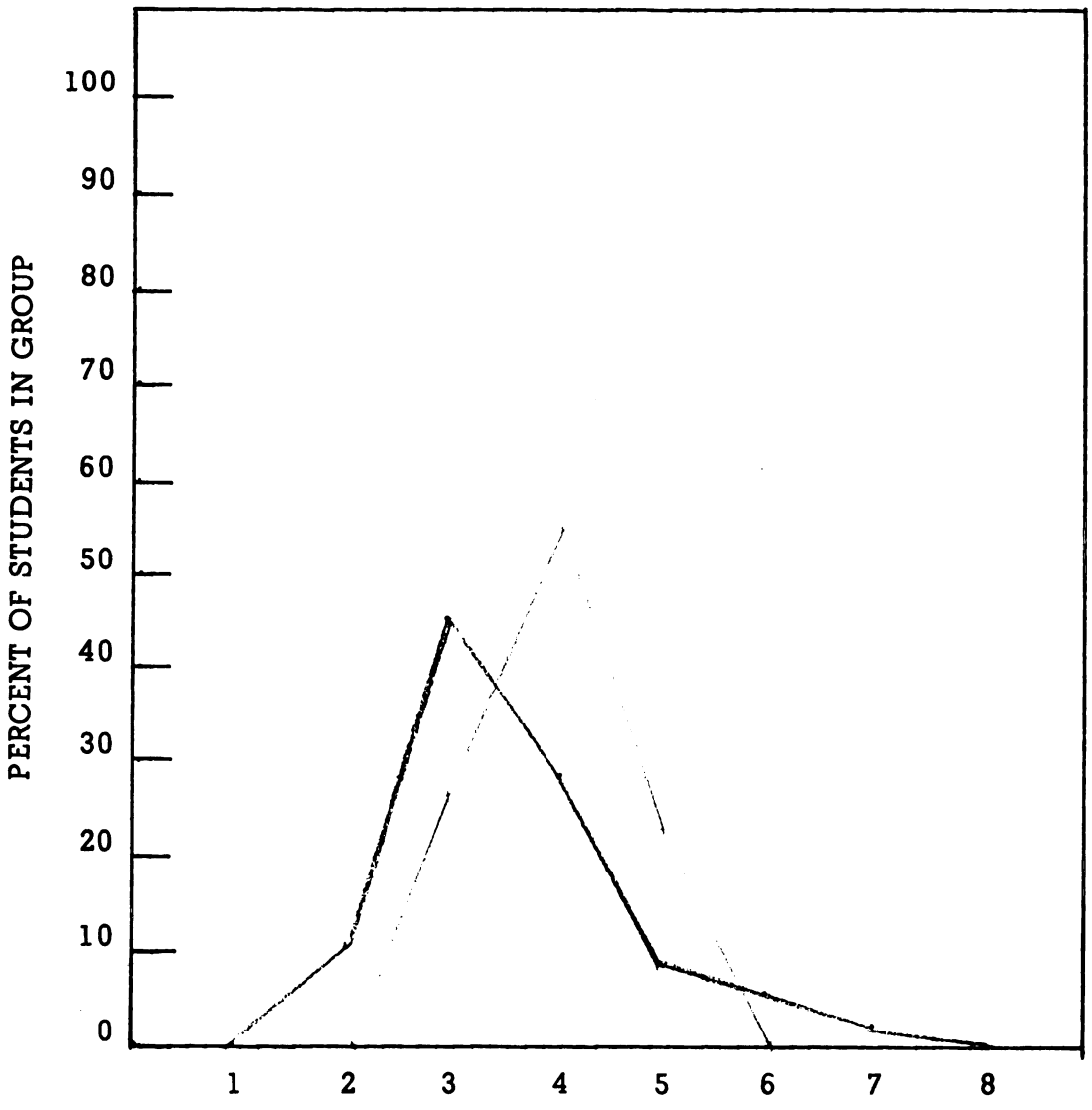


Blue--Reading Average
Red--Arithmetic Average

GRAPH 5

CONTROL GROUP I, SCHOOL B

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

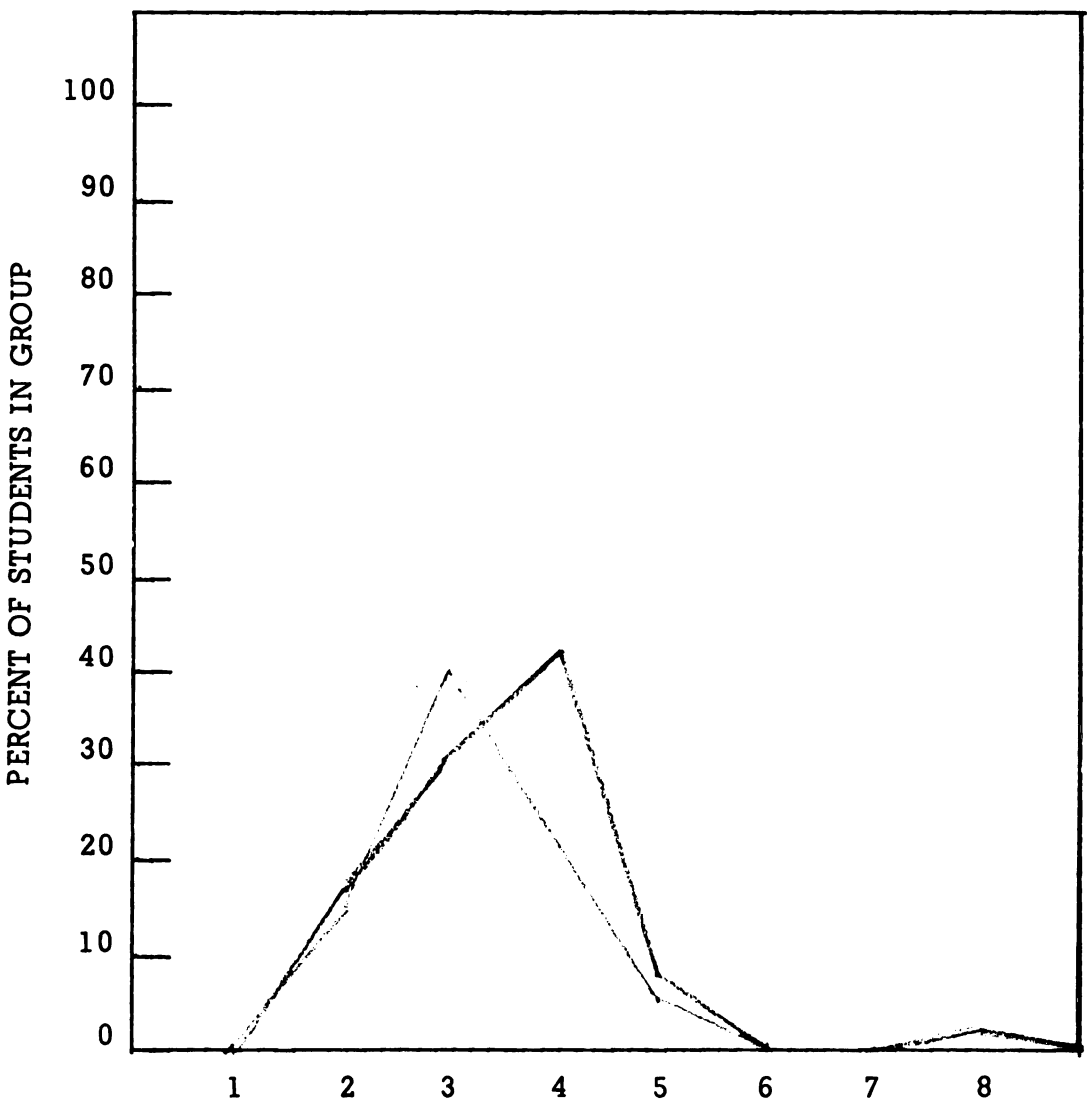


Blue--Reading Average
Red--Arithmetic Average

GRAPH 6

CONTROL GROUP II, SCHOOL B

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES



Blue--Reading Average
Red--Arithmetic Average

Any analytical comments on Graphs 4, 5, and 6 should note that only 25% of the experimental group in School B reached a five-year achievement level. This attainment contrasts with the performance of the experimental group in School A in which 57% reached the five-year level. Yet, while nearly three-fourths of the pupils in School B scored at the four-year level, further analysis will show that for this particular school it was remarkable. The control groups failed to approach this level of performance.

School C besides producing some interesting statistics for this study had another unusual feature worth noting. Among the students annually in attendance at this school are about 30 from a nearby orphanage. Three of these students participated in the Experimental Arithmetic Project. Supervisors at the orphanage welcomed the opportunity to help these pupils with the materials they brought "home" and accepted the project as a more or less regular evening activity during the 1962-63 school year.

Table 15 summarizes the pertinent statistics for School C.

TABLE 15

MEAN SCORES - SCHOOL C

	No. of Students	Mean IQ	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
Control Group I	28	95	3.8	4.4	4.2	4.3
Control Group II	21	97	3.9	4.7	4.2	4.4
Total Control Groups	49	96	3.8	4.5	4.1	4.3
Experimental Group	22	101	4.2	5.3	4.7	5.1

The intelligence quotient mean of 101 for the Experimental Group III and 96 for the total control groups was applied to the T-test with a resulting score of 1.935 which is significant at no acceptable level. Likewise, the reading mean, although registering four months' difference, had a T-test score of 1.258 which is also significant at no acceptable level. The difference in arithmetic averages, however, is highly significant at the .05 level (T-test score: 3.937). The eight-month gain of the experimental group over the combined control groups is the most impressive among the four schools tested.

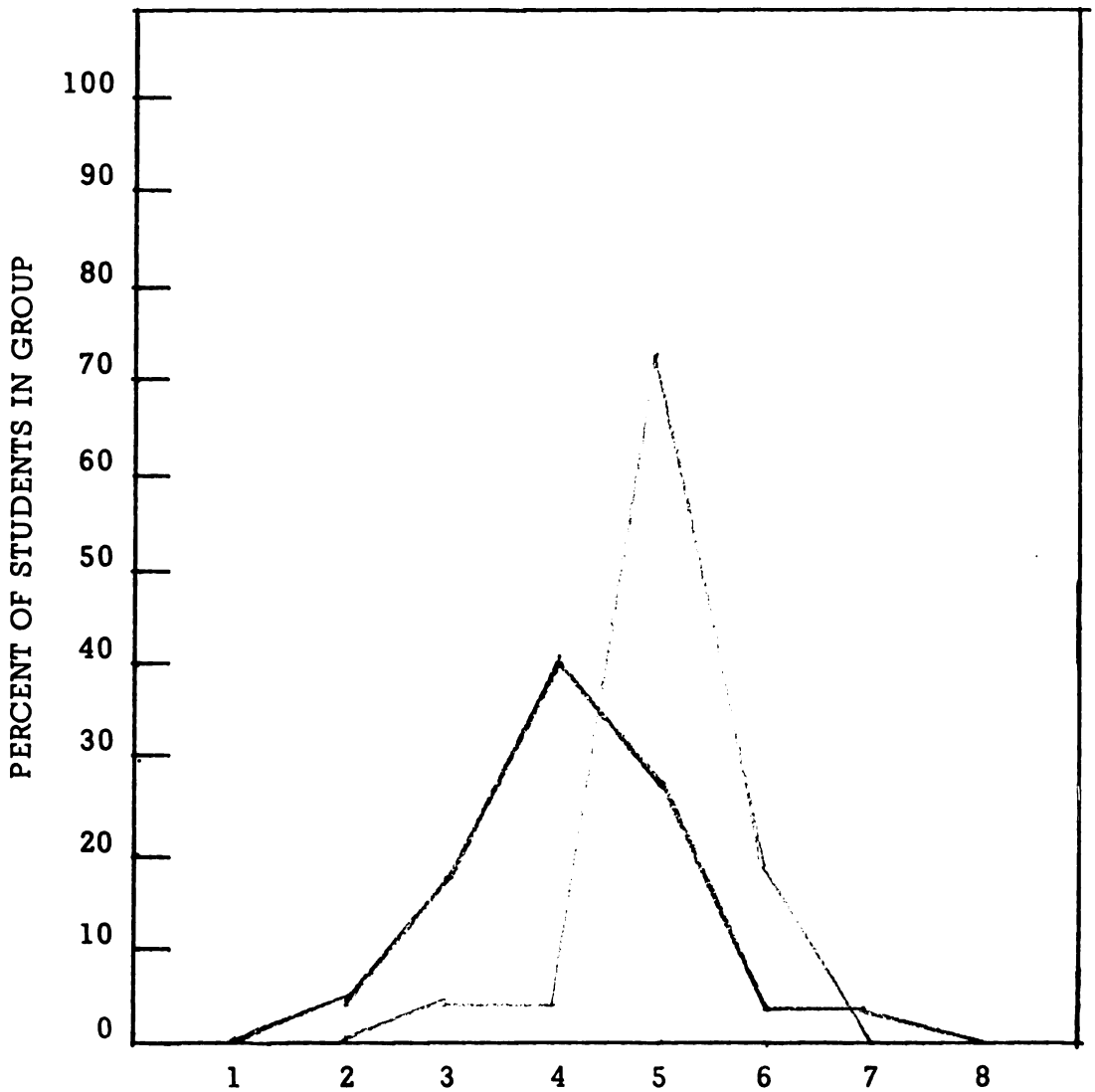
Graphs 7, 8, and 9 are equally illustrative.

In these graphs, 7, 8, and 9, it can be seen that, in the control groups, the highest reading averages equalled and, in one case, exceeded the highest arithmetic achievement level. In the experimental group over 70% of the students attained a five-year level of achievement in arithmetic.

GRAPH 7

EXPERIMENTAL GROUP I, SCHOOL C

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

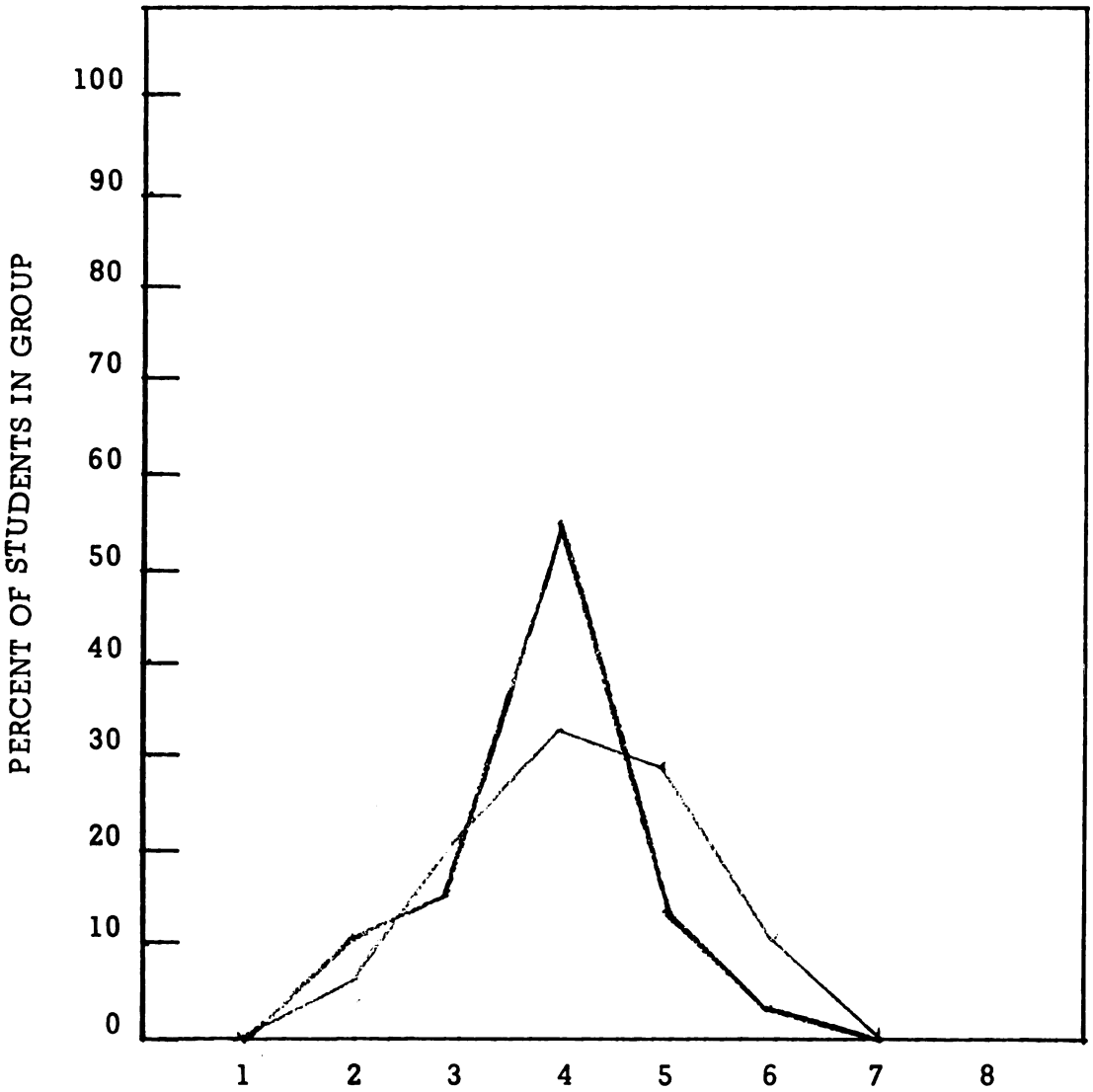


Blue--Reading Average
Red--Arithmetic Average

GRAPH 8

CONTROL GROUP I, SCHOOL C

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

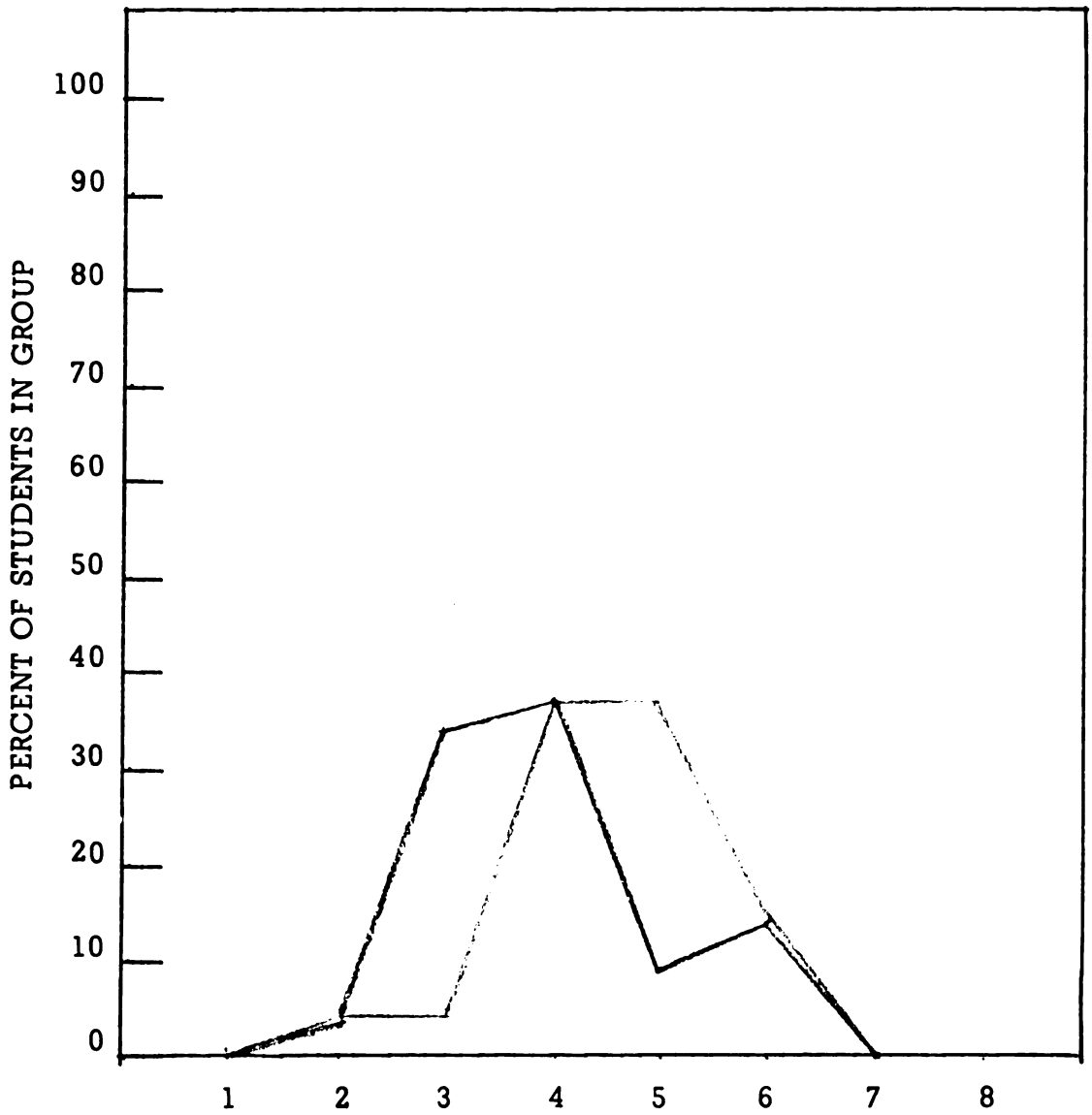


Blue--Reading Average
Red--Arithmetic Average

GRAPH 9

CONTROL GROUP II, SCHOOL C

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES



Blue--Reading Average
Red--Arithmetic Average

School D was the only school which failed to register gains of significant difference. A summary of means is shown in Table 16.

From Table 16 we should note that, comparatively, pupils in School D registered the lowest intelligence quotient average for any experimental groups, the lowest reading averages for all control and all experimental groups, and the lowest arithmetic achievement level for an experimental group. The two-month gain of the experimental group over the combined control groups hardly casts a favorable statistical light in favor of the Experimental Arithmetic Program. This gain yields a T-test score of 1.422 which is significant at no acceptable level. The same data, when translated into graphic form (Graphs 10,11, and 12) gives no encouragement.

Graphs 10, 11, and 12 yield almost identical pictures compared to the differences in the performance graphs for the other schools. In each case, the largest percentage of the class registers a four-year level of achievement in arithmetic, which alone is creditable. As for the reading averages, only in the second control group was any great number of students able to achieve a fourth year reading average.

TABLE 16

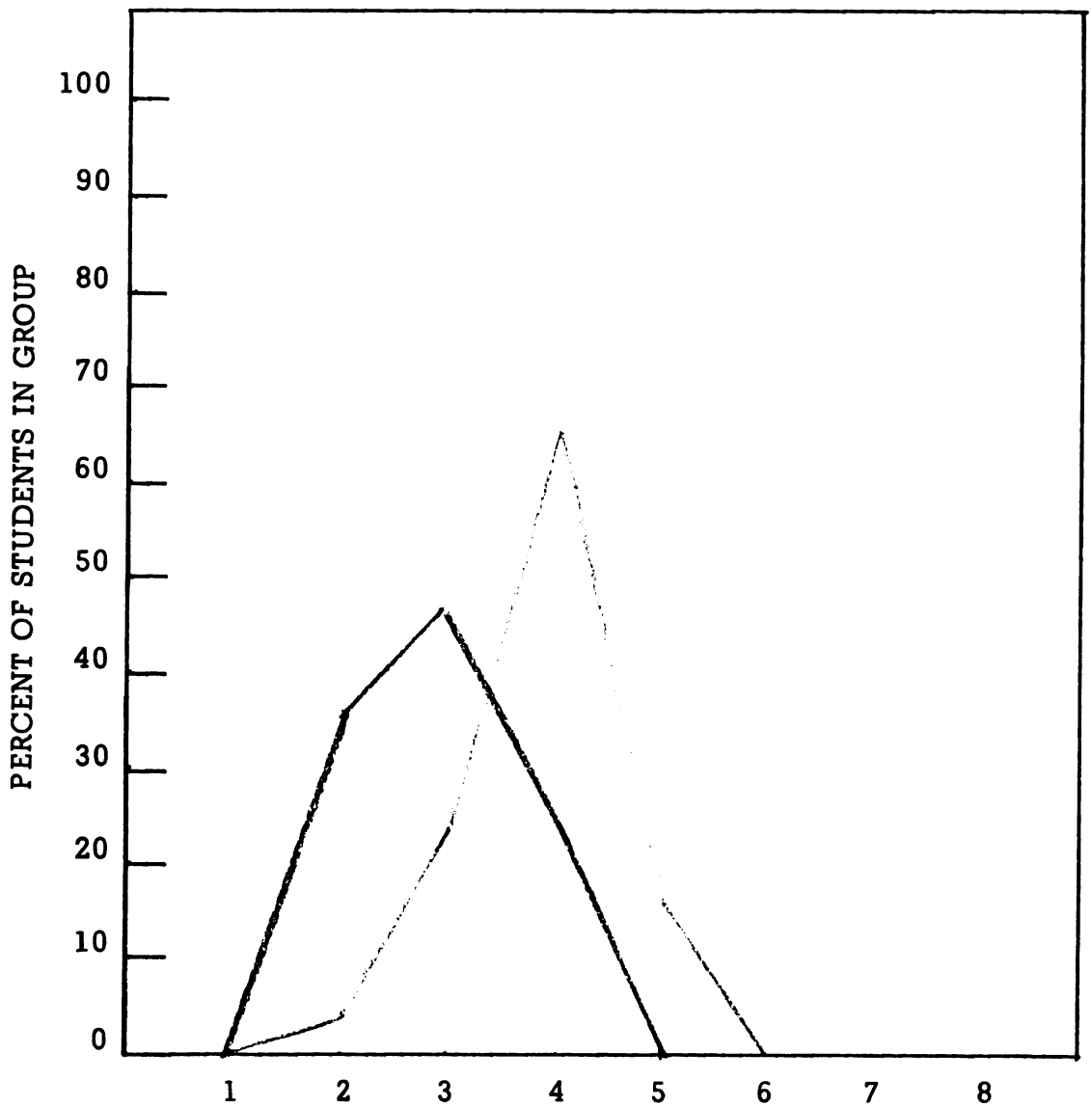
MEAN SCORES - SCHOOL D

	No. of Students	Mean IQ	Read. Ave.	Arith. Reas.	Arith. Comp.	Arith. Ave.
Control Group I	30	97	2.9	3.5	3.7	3.6
Control Group II	33	97	3.5	3.8	3.7	3.8
Total Control Groups	63	97	3.2	3.6	3.7	3.7
Experimental Group	29	96	3.0	3.7	4.0	3.9

GRAPH 10

EXPERIMENTAL GROUP I, SCHOOL D

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

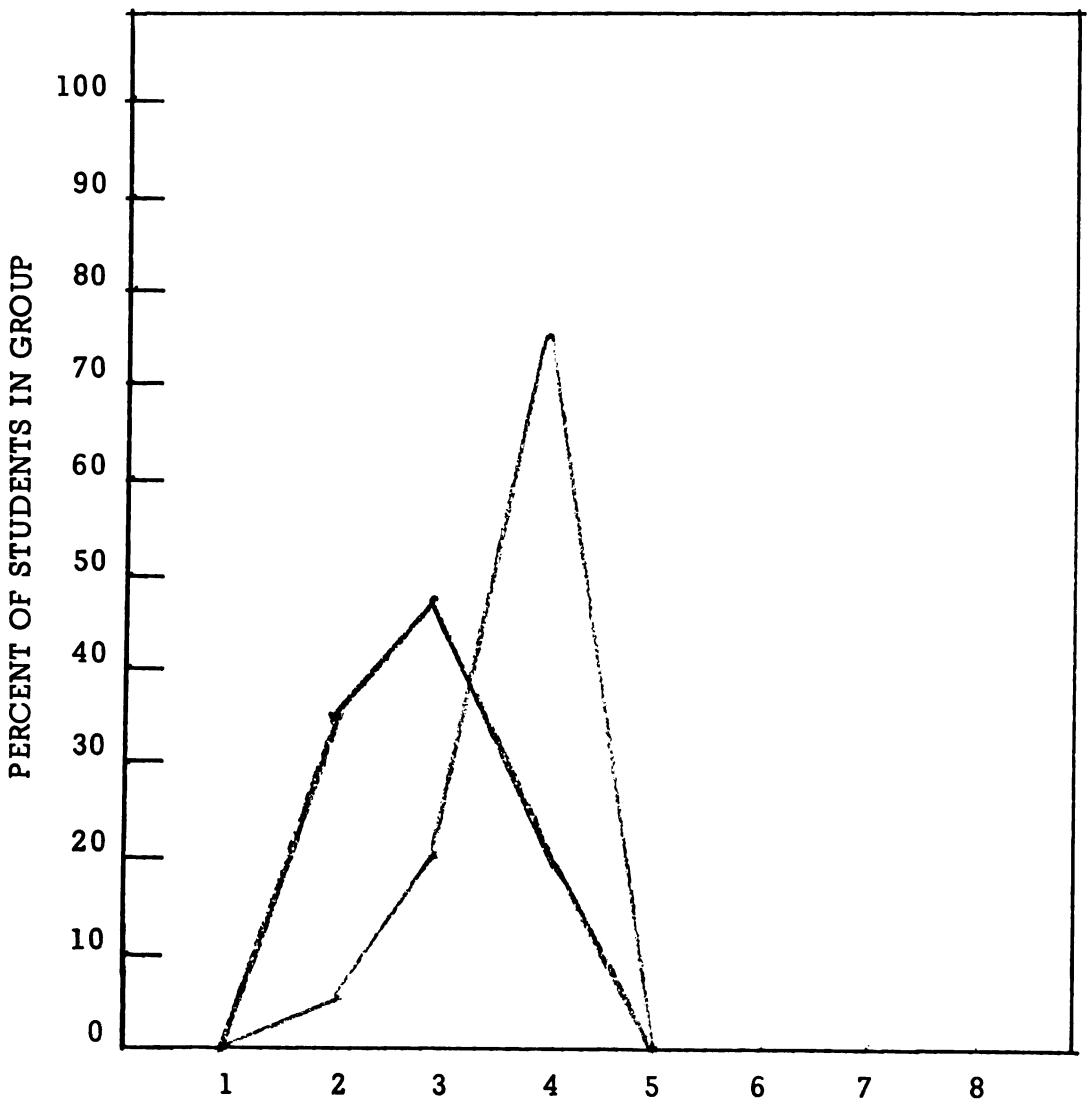


Blue--Reading Average
Red--Arithmetic Average

GRAPH 11

CONTROL GROUP I, SCHOOL D

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES

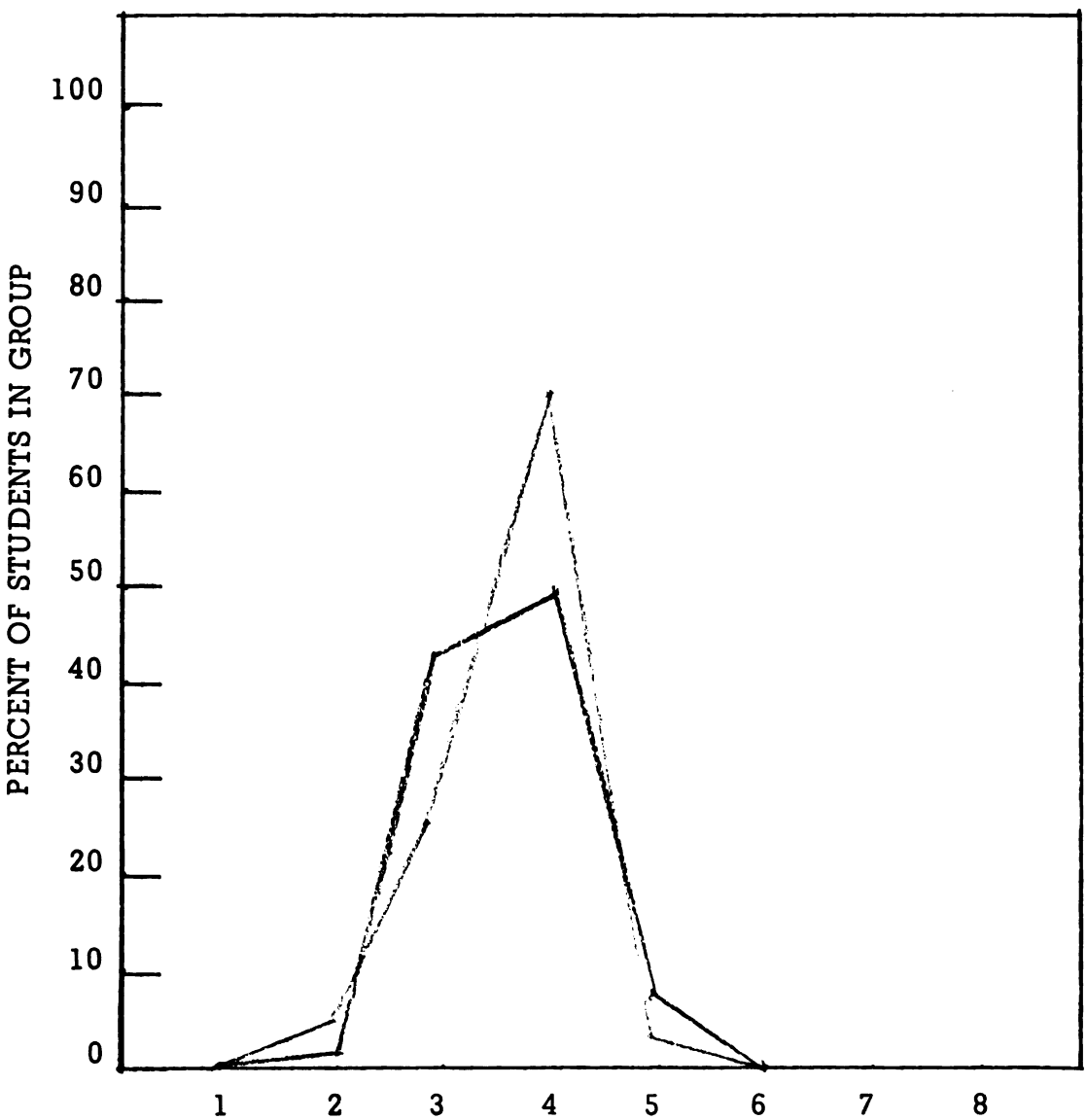


Blue--Reading Average
Red--Arithmetic Average

GRAPH 12

CONTROL GROUP II, SCHOOL D

RESULTS ON STANFORD ACHIEVEMENT TEST
IN READING AND ARITHMETIC SCORES



Blue--Reading Average
Red--Arithmetic Average

Part B: Report On Results of Parent Evaluation Questionnaire

A questionnaire prepared by the researcher and containing 25 items was issued to the parents participating in the Experimental Arithmetic Program. These questions sought adult opinions on the project, in general, and on the material used, on parents' evaluations of their children's attitudes toward the project, and on home study habits. The questionnaire also contained items gauged to discover possible changes in parental attitudes toward school as a result of the parents' participation in the Experimental Arithmetic Program. Lastly, educational and economic backgrounds of the parents were explored for possible relationship to the children's performance levels.

These questionnaires were taken home and returned by the children. However, since the distribution took place during the 1963-64 school year, after the experimental groups had moved into the fourth grade, not all parents who participated in the project could be reached. Some families had moved away from the neighborhood or from the city and could not be located.

Table 17 shows the number of families participating in the Experimental Arithmetic Program and the number returning questionnaires.

TABLE 17

FAMILIES PARTICIPATING IN PROGRAM
WHO RETURNED QUESTIONNAIRE

School	Number of Families	Number of Families Returning Questionnaire
A	61	41
B	27	20
C*	22	22
D	29	20
Total	139	103

*Three pupils in School C lived at an orphanage. Their supervisor returned a letter with the questionnaire stating that her answers regarding study habits and attitudes were general for the three children.

Question One asked: "When you were first introduced to the Experimental Arithmetic Program, what was your reaction? This question particularly sought to uncover possible early hostility to the project as an intrusion on home life. Also, the researcher felt that a negative answer to this question might later be measured against favorable answers to other questions, thereby revealing a change of attitude toward the project as it progressed. A multiple choice of answers was offered. The results from all schools appear in Table 18.

TABLE 18

ACCEPTANCE OF PROGRAM BY PARTICIPATING PARENTS

Number	Answer
75	It seemed like a very good idea.
23	It seemed like a fairly good idea.
0	It made no particular impression on us.
2	It seemed like an annoyance.
2	No answer

The number of parents showing enthusiasm or favorable acceptance of the project so outnumbered unfavorable answers that no attempt was made to analyze this item school by school. Doubtlessly, the above table reflects natural willingness of most parents to help their children toward better progress at school. The two families who considered the project an annoyance later gave equally negative answers to some evaluation questions. One of these families was from School A. The mother stated in answers to later questions that she did not attend any of the meetings connected with the project and that no one helped the child with the project materials at home. She left most of the other questions unanswered. The child, as might be predicted, registered a low arithmetic average score of 3.3 on the Stanford Achievement test.

The other parent who stated that the project "seemed

like an annoyance" was from School C. She attended none of the meetings although she helped the child with the project. The materials, she thought, were satisfactory although, as a result of the project, the child showed no new enthusiasm for arithmetic or for school. Neither the mother nor the father in this particular family enjoyed school themselves. Other answers revealed that this was a low income family and that neither parent finished high school. However, in spite of the negativism of the answers on this questionnaire, the child did remarkably well, registering a 4.6 arithmetic average in the Stanford Achievement test.

Question Two asked: "Did you or your wife/husband attend any of the meetings which were held in connection with the Experimental Arithmetic Program?" The purpose of this question, of course, was to determine what effect, if any, the introductory and evaluation meetings for parents with teachers, principals, and curriculum and adult education consultants may have had on the parents' motivation and their children's progress. One way might be to compare the arithmetic average means of children whose parents did attend any or all the meetings with the means of the children whose parents did not attend. Here are the results:

TABLE 19

ATTENDANCE AT PARENT PROGRAM MEETINGS

	A	B	C	D	Total
Parents attended	24	9	12	16	61
Parents did not attend	17	11	8	4	40

TABLE 20

MEAN ARITHMETIC ACHIEVEMENT LEVELS OF CHILDREN OF ATTENDING AND NON-ATTENDING PARENTS

	School A	School B	School C	School D	Mean
Parents attended	4.7	4.5	5.2	4.0	4.8
Parents did not attend	4.4	3.9	5.3	4.0	4.4

It could be theorized that parents who attended meetings were more conscientious and that this characteristic might carry over into the home with resulting statistical gains in achievement. Table 20 does bear out four months' difference in achievement levels for the four schools' total, but the individual school comparisons only serve to generate confusion. School D which had the highest percentage of parents in attendance at meetings was able to show no

difference in means. Also, as was noted in Part A of the analysis, this school was the only one of four which failed to show significant gains as a result of the project. School C which showed the largest gain in months of achievement for an experimental group over combined control groups (Table 15) actually dismisses the importance of the parent meetings by registering a higher achievement level for children of parents who attended none of the meetings.

It must be assumed that the meetings for parents were useful for the purpose for which they were originally intended: a free exchange of information among parents, teachers, principals, curriculum and adult education consultants. No other side values are apparent.

Question Three asked: "How often did your child bring home packets used in the Experimental Arithmetic Program?" This question was asked primarily to discover if any parents failed to receive packets regularly. If such parents were found, it would be necessary to drop them as statistics for analysis. Among the answers to this question were 69 replies which said, "Weekly." Twenty-nine parents answered, "Almost every week." One said, "Seldom." None stated they never received the materials. The parent who answered, "Seldom," explained that her child entered school late in the year and was ill intermittently.

The researcher had expected that Question Four ("Did you find the materials in the packet too simple, about right, rather difficult to follow, or impossible to follow?") would offer a substantial divergence of opinions and that comparisons could be made, school by school, which would aid in a critical evaluation for improvement of the materials. Returns, however, showed that parents by a large margin (89 out of 103) approved the materials as they were. Nine stated, "Too simple." Three said, "Rather difficult to follow." Two left the question unanswered.

The nine children of parents who stated the materials were too simple had a mean I.Q. of 111, and a high arithmetic achievement mean of 5.3. Logically, those whose parents claimed the materials were rather difficult to follow registered achievement scores below the average for all schools (3.2) although their I.Q. scores were creditable (98, 102, 105).

The take-home materials were divided and categorized for more minute evaluation in Question Five. Four general types of information (see sample packet in Appendix) were sent home weekly: (1) specific written suggestions for parents, (2) descriptions of what was being taught in arithmetic at school, (3) flash cards, games, and materials for

practicing arithmetic skills, and (4) general practice arithmetic problems. It is within reason that these different items in each weekly kit may have held varying strengths or weaknesses in the opinion of parents, that some might be considered more valuable than others, some worthless, and in such case the coordinators of the project might find critical information useful for an extension of the project to other schools. Question Five allowed a multiple choice of answers in evaluating the four sets of items described above. A tabulation of answers by frequency appears in Table 21.

TABLE 21

EVALUATION OF KIT MATERIALS

Item: Teacher's specific written suggestions	Answers
Useful	78
Sometimes useful	18
Useless	2
Didn't have enough acquaintance with item to evaluate	2
No answer	2

Item: Weekly descriptions of what was being taught	
Useful	79
Sometimes useful	20
Useless	0
Didn't have enough acquaintance with item to evaluate	2
No answer	4

Item: Flash cards, games, practice materials	
Useful	77
Sometimes useful	21
Useless	1
Didn't have enough acquaintance with item to evaluate	2
No answer	3

Item: General practice arithmetic problems	
Useful	81
Sometimes useful	17
Useless	1
Didn't have enough acquaintance with item to evaluate	0
No answer	4

Apparently, the materials for the project were well planned and developed, considering the paucity of objectionable feelings of parents as shown in Table 21. However, it should be noted that the project was tested on a small scale for a limited time in two schools the year prior to its introduction as a major experiment in four schools and by this time the planners were at no loss for ideas. Also, the packets were prepared as the project progressed and meetings between parents and the school staff offered useful suggestions for their preparation.

The sixth question, "How did your child 'take' to the project?" sought to measure its appeal to the child. If it were found that a large number of youngsters exhibited reluctance to participate, then logically the project should undergo major revisions or be dropped altogether. Answering this question, 36 parents stated that their children accepted participation eagerly. Fifty-two said, "Willingly, but not eagerly." On the negative side were nine parents who answered, "Obediently but with little or no enthusiasm." Three said, "Reluctantly." Three left the question unanswered.

One might wonder how those children who approached the project with little or no enthusiasm or with reluctance fared grade-wise at the end of the year. Further

checking of the questionnaires and achievement levels of the three who were said to have been reluctant to participate in the project revealed that they attained arithmetic means of 4.5, 4.6, and 4.8. The questionnaires further revealed, quite uniformly, that arithmetic was a rather easy, humdrum subject for them and their attitudes toward school, either good, bad, or indifferent, did not change one way or another. Of those who accepted the project "obediently but with little or no enthusiasm," only two scored arithmetic achievement means below 4.0. Three were above 5.0. The two lowest achievers (3.0 and 3.4) had erratic study habits and their attitudes toward arithmetic and school did not improve as a result of the project, according to other answers in the questionnaires. The parents of these children, however, were laudatory in their acceptance of the program.

Question Seven inquired, "Who helped your child with the project most of the time?" Table 22 tabulates the answers, school by school.

TABLE 22

PARENT HELP WITH MATERIALS AT HOME

School A	School B	School C	School D	Total	Answer
0	0	0	1	1	No one
34	14	13	13	74	Mother
4	4	3	3	14	Father
3	2	6	3	14	Someone else

Those who answered "someone else" indicated in almost equal frequency that the person was a grandparent or older brother or sister.

Investigating this question further, it was found that there was little difference in achievement levels no matter who worked with the child. Arithmetic achievement means, school by school, are shown in Table 23.

TABLE 23

RELATIONSHIP BETWEEN ARITHMETIC ACHIEVEMENT MEANS AND HELPER

Helper	School A	School B	School C	School D
Mother	4.7	4.4	5.2	3.9
Father	4.8	4.4	5.4	3.2
Other	4.3	4.2	5.3	3.8

There is an interesting similarity in the sets of scores listed under each school. While it appears that there is not much difference who helped the child--mother, father, or others--there is, however, some hint that one school generated more enthusiasm for the project among parents and children than the other three.

Question Eight sought to investigate study habits for possible relationships to achievement levels. To the query, "How much time was spent on the project and how often was it done?" the following answers were received:

TABLE 24

TIME SPENT ON THE PROGRAM BY FAMILIES

Schools				Answers
A	B	C	D	
1	1	4	3	It was an everyday project.
8	9	10	7	It was done almost everyday of the week.
31	9	6	9	It was done irregularly on different days of the week.
0	0	0	0	It was seldom done.
0	0	0	1	It was never or practically never done.
1	1	2	0	No answer

Few parents were militant taskmasters and those who were, were not all rewarded. Only the children of the four parents in School C who made the experiment an everyday task were able to produce high arithmetic means. The achievement average for these four was 5.6. The one in School B attained 4.4; the average for the three in School D was 3.6. Here are the achievement means of children who were helped almost everyday or irregularly: School A: 4.7; School B: 4.4; School C: 5.2; School D: 4.0.

The outcome of this project, achievement-wise, adds weight to the body of belief that compulsory homework for early elementary children will produce more harm than good. It supports statements in Chapters I and II which claim that any home study done by children of this age group should be recreational or at least appealing to a point that they will be compelled to do it out of enjoyment. It must be emphasized again that the Experimental Arithmetic Program was one of voluntary participation, that its chief aim was to educate parents in the problems of arithmetic teaching.

The ninth question, as its one answer revealed, proved to be a rather unnecessary question. It asked, "If work on the project was seldom or never done, would you explain why in a word or two?" Only one had replied that

the work was almost never done. The reasons, this parent stated, were illness and family problems. It might be surmised that if only one parent in 103 families found the project an interference with pressing household problems, the project was one of high acceptance.

The next three questions explored attitudes of children. Question Ten asked, "What effect did the project have on your child's attitude toward arithmetic?" Among the multiple choice of answers offered to this question, 52 parents selected, "His attitude toward arithmetic improved." Thirty-nine answered, "His attitude toward arithmetic was good to begin with and the project made no change in his attitude." Only five said that, "His attitude toward arithmetic was poor to begin with and the project made no change in his attitude." Two claimed the project gave their children a disliking for arithmetic. Five parents abstained from answering.

One of the chief aims of the Experimental Arithmetic Program was to make allowances for individual differences by "personalizing" the materials with which the parents worked with their children. This was done through weekly written suggestions from the child's teacher. Parents were cautioned against pushing their children beyond their capacities. How well this individualized approach worked

can be best reflected in the fact that over half the parents stated their children's attitude toward arithmetic improved. One can only speculate about the seven children whose parents reported no improvement in originally poor attitudes or said the project gave their children a disliking for arithmetic. Among the possibilities which enter the picture are family attitudes toward education in general. An examination of the seven negative questionnaires, however, brings out conflicting answers. Without exception, all the parents approved the project and its materials. However, of 14 mothers and fathers in these families, only one mother and two fathers were graduated from high school. Only three mothers and two fathers stated they, themselves, had liked school. Few attended school functions with any great frequency. Yet, it would be unjust to blame parental attitudes alone for the lack of improved interest in arithmetic among their children, for there were doubtless other factors at play beyond the scope of this questionnaire. It would, after all, be opportunistic to expect a project such as this to reap 100% favorable results.

Question Eleven was an extension of Question Ten. It asked, "Did the project change your child's attitude toward school in general or toward other courses and

activities?" Table 25 lists the answers allowed and the frequency of replies from all four schools.

TABLE 25

EFFECT OF PROGRAM ON CHILDREN'S ATTITUDES TOWARD OTHER COURSES AND ACTIVITIES

Number of Responses	Answer
15	It brought about much change and improvement in his attitude
45	It brought about some change
39	It brought about little or no change
1	It changed his attitude for the worse
3	No answer

At least 60 parents felt the project was instrumental in effecting in their children a more favorable attitude toward school. The 39 children whose attitudes were said not to have changed were unusually high achievers, registering an arithmetic achievement average of 5.4 as a group. It should be fair to presume that their attitudes toward school were, by and large, good to begin with. The parent who stated her child's attitude toward school had changed for the worse penned this note under her answer:

> I'm not sure if the program caused it or not though. He doesn't like criticism at all now. His

> teacher says he is belligerant, and we never had that kind of complaint before. He know (sic) longer likes school, only a few subjects, spelling, gym, english (sic).

A further extension of Questions Ten and Eleven which evaluate children's attitudes was Question Twelve which asked, "What effect, if any, do you think this project may have had on your child's progress in his current fourth year in school?" Fifty-six stated it helped their children in their progress. Forty-one said it would be hard to say if the project had any effect at all. None said it retarded the child's progress. Six left the question unanswered. The 41 children for whom any change in progress was doubtful had a mean arithmetic average of 4.8 as a group which indicates the greater percentage of them had had little or no difficulty in school in the first place. Those who showed improved progress had as a group a slightly lower achievement mean (4.5). While significant at no acceptable level, it hints, nonetheless, that the lower achievers may have benefited more.

The inquiry into attitudes spotlights the parents in Question Thirteen. It gave the parents a choice of six appraisals from which they could select any number. Here is how this particular item appeared in the questionnaire. (The underscored figures indicate the number of answers).

As a result of this project, would you say:
(Check any number of answers)

56 you have a better understanding of third year arithmetic as it is now being taught?
65 you have a better understanding of what your school is trying to do?
35 you feel closer to your school in general and to your child's progress in particular?
10 you feel no closer to your school than before and your understanding is unchanged?
3 you are confused about what your school is trying to do?
5 you do not think your school is 'on the right track?'

The large numbers affixed to the first three items leave little doubt that a home-school project such as the Experimental Arithmetic Program has far-reaching values beyond expected benefits in a restricted field of learning. They not only indicate that over half the parents gained a better understanding of arithmetic teaching problems but that many more now have a better understanding of the serious efforts of professional educators to help their children. An important role for public school adult educators is that of developing and strengthening home-school ties, and the contribution made in this direction by the Experimental Arithmetic Program appears to have been substantial. The negative answers to item 13 bear scrutiny. Of the ten parents who stated they were no closer to school than before and that their understanding was unchanged, eight, according to other answers found in their question-

naires, were frequent participants in school-sponsored affairs and, in general, were high in their acceptance of this project. It can be assumed then that eight of these ten parents already had healthy school ties and were in no special need for indoctrination. The three who stated that they were confused as to what their school was trying to do had also answered (to Question Two) that they attended none of the introductory or evaluation meetings connected with the project and that they attended few school-sponsored functions. Their appraisal of the project, however, was one of acceptance. Each of the five parents who selected to answer that they did not think their school was "on the right track" had also checked either or both of items 1 and 2 in this list of answers and had answered other questions quite favorably. Since such replies so strongly conflict, the writer can only guess that the parents in reading the above list had missed the word, "not," in the sentence. If such a conclusion is not acceptable, then the researcher is at a loss to draw another.

Answers to the 14th item in the questionnaire revealed that 73 parents felt the Experimental Arithmetic Program should be extended and continued for all third-year pupils. Twenty-two felt it should be offered to some other third-year pupils. Two felt it should not be offered

at all. These two also answered (in Question Ten) that the project gave their children a disliking for arithmetic, and the researcher feels that, although unfortunate, these must be accepted as honest-intended answers.

Question Fifteen sought suggestions for improvement, in case the project were offered again. This item actually is an elaboration, or extension, of Question Five which evaluated the categorized kit materials. The suggestions are listed below along with the number of parents who checked each item.

27	More arithmetic materials for use by the child, like flash cards, games, rulers, and milk cartons.
34	More specific written information regarding your child's work.
23	More meetings with the teacher.
16	Program at a different grade level.
15	A fuller description of what is being taught in class.
25	More general practice problems.
	If other, please list below.

The one item on the above list which should be specially noted by planners, should the project be extended to other classes or other schools, is the second item, "More specific written information regarding your child's work," which was selected by 34 of 89 parents who answered.

Item 16 invited general comments for further evaluation. Forty-six parents took the trouble to reply. Their

statements, with some editing of grammatical and spelling errors, are quoted below. The researcher categorized these statements in two general groups. One section contains affirmative comments; the other section is made up of negative replies or suggestions for improvement.

Affirmative Comments

> It is an excellent program that I would welcome in any subject, any grade and which, I feel, would give parents a lever to use by their knowing what is being taught and expected of student, particularly in junior high on. I was most unhappy about teacher telling the students it was not required work for them and that they didn't have to complete it. Once a project is started, it should be completed the student should be given a definite sense of responsibility to do this.
>
> Our little girl has had a hard time understanding arithmetic and a lot of the materials in the project made it easier to understand. This program also helped her to be a little bit more imaginative.
>
> To me, it was a wonderful program for our boy. He was and still is slow at numbers and it helped a lot. The flash cards and other games and things we worked with helped more.
>
> I feel the program was very worthwhile. I am sure my child was aided by the extra help at home. The written information regarding class work was most helpful. We learned where he was making mistakes and were able to work on them.
>
> I would like to see it continued through other grades as well as third.
>
> I am pleased that our children in Flint have had an opportunity to be introduced to Modern Math and have been able to participate in an experimental program.

I think it should be continued. I believe the third grade is the grade to begin with. If a child is slow in his arithmetic this is a good grade in which to start giving him help.

The Arithmetic Program helped my child. She has now a better understanding on all forms of numbers.

I like the way arithmetic is being taught. I think the teacher is doing a fine job. Especially, I like the way the teacher informed us of special weaknesses. I got a better idea of just how my child was doing in math. I found the teacher's specific written suggestions for my child very useful in giving her any extra help she might need at home.

I think this was an excellent program if the parents helped the child. Otherwise, it is useless.

I think it was a very worthwhile program. It started a good home study pattern and we saved all the practice sheets for summer review.

I think this type of intensive study could be given to the higher grades (4th, 5th, and 6th) as well.

I think the program was a great help in explaining weekly work. It explained problems in a little different way, and let us, as parents, know from week to week where our child needed help.

The experimental program helped my child to understand arithmetic better. Now he doesn't forget as easily as he use to. I would like to see a program like this one extended on through the 6th grade.

I think it was very helpful and encouraging.

I thought it was worth the effort that was put into it. The people who were behind it were capable and knew what they were doing.

I think it's the best idea yet.

I liked the program and I know it helped my child very much.

I think this program is especially good for the slower students. It guides parents in helping them improve. If the course should be offered to my second child, I'm sure we would spend a lot more time on it together.

I think the program was wonderful. It helped my son gain a clearer understanding of his work.

The program seemed to eliminate confusion. Our method of helping the child at home improved. Before the program it was my child's common phrase, 'That isn't the way the teacher does it.'

I think the program was good. My child was not very interested in school but I could tell a marked improvement in his work and his attitude toward school.

We enjoyed the arithmetic program. It gave us the opportunity to carry on interesting experiments with measurements of all kinds: length, capacity, time, and money.

I think the program helped my child to progress in arithmetic as well as her reading. I think it should be continued.

Kathy enjoyed the materials given to her and used them often. She was eager to get new lessons each week and so was I. We enjoyed working together on her arithmetic and it actually gave us more time together. It's a very good program.

We felt the program brought our child closer to us. It became a game for the whole family. Also it made the child aware of our interest in her education.

The year we spent with our child in the Experimental Program was an enjoyable year.

By having this material we knew how to help our child over trouble spots of arithmetic. It was a

relief to her and us.

I feel the program has helped my son in his fourth grade arithmetic. He thoroughly enjoys it this year. He also enjoyed doing the work while in the program.

My child went to summer school for reading and arithmetic. This summer he used his flash cards and games and problems so I feel they did him more good than summer school. They say they get more help in summer school because they have more time to spend with each child. But Kenneth said they didn't give him any more help than he received in school during the year.

Negative Comments or Suggestions for Improvement

I think it would be most helpful to certain children but it was of no particular value to mine except for when milk carton, rulers, etc., were sent home for measurement studies.

I think that if the program is continued some thought should be given to the effect it has on the development of the child's self-reliance and personal study habits. Certainly, in years to come mother or dad cannot and should not always be readily available to help little 'Johnnie' with all problems as soon as they arise.

I found that in my own family, with several children's music practice to supervise, homework, Scout activities, Sunday School homework, etc., time to support this program properly was a problem.

I believe parents do not have time and children do not have time to spend on this much work. It was work that should be done almost daily and with three children and the many things of everyday living it was not possible for me to spend the needed time.

The program helped improve my son's attitude toward arithmetic. As the program progressed, however, the problems became seemingly too easy. I feel they should have been more challenging at the latter part.

I feel the program will not work if it is left on a voluntary basis. If it is an assignment, it is much more apt to be done. As it was, it was probably done mainly by children who were conscientious and good in arithmetic to begin with.

I think the children learn more and learn better using the old standard method. I think there are too many problems involved for most children and that the old method was clearer to them and easier to understand.

Good program. Not enough challenge so became bored with it.

Flash cards and measurement aids very good. Most games not interesting enough to hold attention. Teacher's comment on week's work very helpful. Program should be continued with change, mainly to keep child interested throughout entire year.

Having five children under nine years of age makes it more difficult to spend time with individual children.

Teacher should explain more about what could be done at home to further help the child.

I personally enjoyed the group meetings and felt that had they been held oftener we would have benefited from them.

The materials appeared too simple for the grade level.

This is a very good program for the slower students but does not present enough challenge to the more advanced student.

> I don't know if William is up-to-date. Also, I do not have time to check on him regularly. If for some reason he starts dreaming and does not do his work, please awake him up one way or the other. Also, I will appreciate being informed about it.
>
> Seems to me that the older method of teaching division was far easier to follow. More system to it.
>
> My son seemed to enjoy this arithmetic. He generally got most of the problems right but this hasn't seemed to help him for this year at all.

The second section of the questionnaire (Part B) contained nine questions delving into the educational and economic backgrounds of the parents participating in the Experimental Arithmetic Program. The researcher considers the information gathered from this part of the survey of prime importance for its insight into the general types and sub-types of population to which the project was introduced. An attempt will be made to discover possible relationships between parental backgrounds and the degree of their success in the program.

The first two questions in Part B were planned to help determine whether the population studied was highly mobile and long established in a certain economic or social environment. These two questions and the frequency of replies made to them are shown in Tables 26 and 27.

TABLE 26

RESPONSE TO: "HOW LONG HAVE YOU LIVED IN FLINT?"

School				Total	Answer
A	B	C	D		
2	1	7	1	11	5 years or less
39	18	12	19	88	More than 5 years
	3	1		4	No answer

TABLE 27

RESPONSE TO: "HOW LONG HAVE YOU LIVED IN YOUR PRESENT ELEMENTARY SCHOOL NEIGHBORHOOD?"

School				Total	Answer
A	B	C	D		
6	11	11	1	29	5 years or less
35	8	8	19	70	More than 5 years
	3	1		4	No answer

School C which was described earlier as having the most "transient" population of the four under study, should be given close examination. Of the twenty parents from that school who returned questionnaires, seven stated they

had lived in Flint five years or less; eleven had lived in that school neighborhood only a few years. Should this project be found to be effective in helping parents of youngsters who had been transferred from one school to another and who had been handicapped by the inconveniences of the transfer, then the Experimental Arithmetic Program might be said to have an additional desirable value. Examination of records show that the children of these parents had, as a group, an arithmetic achievement average of 5.2. The lowest individual score recorded was 4.6; the highest, 5.6. The researcher realizes that both the size of the group in numbers and the measurement used to gauge values are hardly reliable. However, the creditable achievement records of these children certainly disqualify population mobility as a significant detriment to possible failure of the project.

The third question in Part B sought to uncover the degree to which the parents in this project were school-associated. The items listed for selection are those most common adult activities held regularly in Flint elementary schools. Table 28 lists the frequencies of answers coming from all parents.

TABLE 28

PARENT ATTENDANCE AT SCHOOL FUNCTIONS

Activity	Regularly	Sometimes	Never
PTA meetings	20	42	14
Child Study	6	15	38
Men's or Women's Club	10	13	32
Adult Education Classes	8	22	30
School fairs or concerts	22	52	10

Little is unraveled from a brief study of Table 28 other than the fact that PTA meetings, school fairs, and concerts were more popular school functions than others. To determine with any degree of exactness the amount of school association of the parents involved in this study, further examination is needed. The researcher found it necessary to establish lines separating the associated from the non-associated. The frequency of three or more school functions mentioned as having been attended "regularly" or "sometimes" seemed a reasonable demarcation line. Those who most frequently marked "never" or who regularly or sometimes attended only one or two functions, were classified as non-associated. With these lines of measurement, the figures on Table 29 emerged.

TABLE 29

DEGREES OF SCHOOL-ASSOCIATION OF PARENTS IN FOUR PARTICIPATING SCHOOLS

Item	School A	School B	School C	School D
Attendance at 3 or more functions	24	5	6	7
Attendance at less than 3 functions	17	14	12	10
No answer	0	1	4	3

School A, which it is noted in Table 27 as having 35 families who had lived in the school neighborhood five years or more, registered the greatest degree of school-association. School C, with the greatest population mobility, likewise registered a low school-association figure, indicating that the length of residence in a school neighborhood may have an effect on parents' attendance at school functions.

Another item of interest which was brought out by this particular question was the apparent lack of variation between the frequency of school-association and the effectiveness of the Experimental Arithmetic Program as an instrument of parent motivation. The arithmetic achievement averages of the children of the school-associated and

non-school-associated parents are revealed in Table 30.

TABLE 30

ARITHMETIC ACHIEVEMENT AVERAGES OF CHILDREN OF SCHOOL-ASSOCIATED AND NON-ASSOCIATED PARENTS

Item	Arithmetic Achievement Averages			
	School A	School B	School C	School D
School associated	4.1	4.5	5.4	3.7
Non-school associated	4.6	4.5	5.2	3.8

Since in only one school do children of school-associated parents outdo those of non-school-associated parents, it cannot be concluded that the success of the Experimental Arithmetic Program was related to the degree of school involvement the parents may have had prior to the beginning of the program.

Question Four of this section measures the amount of formal education earned by the parents participating in the project and attempts to make classifications from which certain generalizations can be made. To the question, "How far did you go in school?" ninety-seven replies were made for mothers, 102 for fathers. The distribution of answers

appears in Table 31.

TABLE 31

EDUCATIONAL LEVELS OF PARENTS

Item	Mother	Father
8th grade or less	7	16
9th grade	8	6
10th grade	7	10
11th grade	7	6
12th grade, but did not graduate	4	4
High school graduate	47	31
College, but did not graduate	12	14
Four-year college degree	2	8
Graduate work in college	2	3

Sixty-five per cent of the mothers and fifty-five per cent of the fathers answering this questionnaire were high school graduates. A total of sixteen mothers (16.5%) and twenty-five fathers (24.5%) had some college education. While these figures release some knowledge of the educational backgrounds of the parents under study, one cannot resist the attempt to compare backgrounds with performance. To do this, the researcher encountered difficulty in making

sharp group separations for comparison purposes. For instance, in many cases one parent graduated from high school while the other did not. The same problem applied to college attendance. A fairly reliable method, it was felt, would be to compare sets of parents, both of whom had graduated from high school, with sets of parents, neither of whom had graduated from high school. Another group comparison was made between parents either or both of whom attended or were graduated from college and parents with no college experience. The arithmetic achievement averages from the Stanford test were again used as criteria.

In the four schools under study, it was found that there was a total of forty-three sets of parents who had been graduated from high school. The arithmetic achievement mean of the children of these parents was 4.9. The children of the thirty-seven sets of parents, neither of whom had been graduated from high school, scored an achievement mean of 4.2. The seven-month difference in achievement between these two groups is noteworthy. In thirty families in which one or both parents either had some college education or were college graduates, the children scored an achievement mean of 4.7. Children of the sixty-six non-college parents registered a 4.4 average, a decline of three months.

Question Five of Part B ("Did you enjoy school when you attended?") was asked with the premeditated conclusion that any large amount of adversity found among the parents toward school would have an equally large negative effect on achievement levels. The frequency of replies to this question is shown on Table 32.

TABLE 32

ANSWERS TO: "DID YOU ENJOY SCHOOL WHEN YOU ATTENDED?"

Item	Mother	Father
Very much	47	28
Quite well	36	39
Tolerably	6	15
Not much	5	6
Not at all	1	0

Analyses of previous questions (Nos. 10-13) have referred to the few negative answers made to this particular question. A few parents participating in the program made generally negative replies throughout the survey and were among those who stated they had not enjoyed school when they attended. The strongly one-sided response to this question, however, leaves little value in any further

analysis.

Further understanding of the makeup of the population studied is derived from Question Six which asked parents to indicate their age group. Although it was stated that answering this question was purely optional, only 9 of 103 questionnaires left this item unanswered or incomplete. Table 33 summarizes the ages of the participating parents.

TABLE 33

AGES OF PARENTS PARTICIPATING IN THE PROJECT

Age Group	Number of Mothers	Number of Fathers
20 to 29	19	5
30 to 39	48	52
40 or over	23	37

Was the performance of parents in any one age level superior to those of another age level? To answer this question, using children's achievement levels as criteria, we are again faced with the dubious task of establishing definite age groupings. Inevitably, in a number of cases, the father was in one age group and the mother in another. The researcher decided to establish five groups for measure-

ment. They are listed below accompanied with figures indicating the number of parents in each group and the achievement averages of their children.

TABLE 34

PARENTAL AGE GROUPS AND ACHIEVEMENT AVERAGES

Item	Distribution	Arithmetic Achievement Average
Both parents in 20-29 age group	4	4.0
One parent in 20-29 group, another in 30-39 group	15	4.6
Both parents in 30-39 group	37	4.5
One parent in 30-39 group, another in over 40 group	16	4.4
Both parents over 40	22	4.6

Of the four children whose parents were both in the young, 20-29, age group, one registered an achievement score of 3.0. This considerably damages the mean score for those in this particular group. Beyond that, there is little difference in achievement levels of the children of parents in other age groupings. Certainly, no great

emphasis can be directed to the differences of ages of parents as far as the success of the program was concerned.

The last three items in the questionnaire attempted to explore the economic levels of the parents participating in the Experimental Arithmetic Program. They asked the occupations of the parents, whether the family resided with relatives, in an apartment, a rented house, or their own home, and inquired about the annual incomes of the families. Answering these questions, the parents were told, was optional; no great effort was made by the researcher to draw up an extensive analysis. Rather, a fairly general idea of the economic backgrounds of the parents under study was sought with the view of appraising the performances of groups of parents in the different economic strata. Table 35 summarizes the answers gathered.

TABLE 35

TABULATION OF ANSWERS TO QUESTIONS REGARDING
ECONOMIC STATUS OF PARENTS

	School A (41 returns)	School B (20 returns)	School C (22 returns)	School D (20 returns)	Total
OCCUPATION OF MOTHER					
Housewife	27	16	14	10	67
Office worker	8	1	.....	1	10
Waitress	.....	.....	1	1	2
Sales clerk	.....	1	.....	2	3
Factory	4	1	.....	2	7
Nursing	1	.....	1	1	3
OCCUPATION OF FATHER					
Unskilled labor	13	6	9	6	34
Skilled labor	7	5	7	6	25
Salesman	2	.....	1	2	5
White collar worker	.....	6	.....	.....	6
Professional fields	1	1	1	.....	3
Small business	3	1	1	1	6

TABLE 35--Continued

	School A (41 returns)	School B (20 returns)	School C (22 returns)	School D (20 returns)	Total
PLACE OF RESIDENCE					
With relatives	.....	.....	.....	.....	.....
In apartment	5	1	3	.....	9
In rented home	3	.....	8	2	13
In own home	32	17	8	15	72
ANNUAL FAMILY INCOME					
Less than $5,000	2	4	5	3	14
$5,000 to $9,000	22	11	14	12	59
Over $9,000	12	3	.....	1	16

While School C registers an employment status and income level slightly lower than the rest, one can readily conclude from Table 35 that the majority of families participating in this experiment were middle class, or, by Flint standards, average Flint families. In defining standard, the researcher referred to the Flint and Genesee County Census Tract Project which states that 69% of the homes in Flint are owner occupied.[1] Further, this publication points out, the yearly median income for Flint families (using 1959, a poor auto production year, hampered by a steel strike and shutdowns) was $6,340, well above the national average of $5,660.[2] With but few exceptions, the fathers who appeared on Table 35 as skilled or unskilled workers, also indicated they were auto plant employees, part of the working force which comprises 80% of Flint's manpower. Yet, within the groups of families in the four school neighborhoods involved in this study, there were pockets of lower and higher income families. It should be worthwhile (if somewhat shaky, considering the small numbers of families in the lower and

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[1]The Council of Social Agencies of Flint and Genesee County, Census Tract Project: Flint and Genesee County (1960-63), p. 50.

[2]Ibid., p. 79.

higher income groups) to investigate the performances of the different groups. Table 36 illustrates the differences of achievement of the children of families in three income levels.

Inescapable is the fact that achievement levels of children and, perhaps logically, the performances of parents increased with family incomes. However, the small numbers of families in the lower and higher economic levels hardly offer substance for plausible measurement.

TABLE 36

ACHIEVEMENT MEANS OF CHILDREN OF FAMILIES
IN THREE INCOME GROUPINGS

	School A		School B	
Income	No. of Families	Arith. Ave.	No. of Families	Arith. Ave.
Less than $5,000	2	4.3	3	4.3
$5,000 to $9,000	21	4.7	10	4.4
Over $9,000	12	4.8	3	4.7

TABLE 36--Continued

School C		School D		Total	
No. of Families	Arith. Ave.	No. of Families	Arith. Ave.	No. of Families	Arith. Ave.
5	5.2	3	3.7	8	4.4
13	5.3	12	3.9	56	4.6
0	...	1	4.6	16	4.7

CHAPTER V

CONCLUSIONS

This study sought to measure the impact of an experimental adult education project carried out during 1962-63 in the community schools of Flint, Michigan, under the sponsorship of the Mott Adult Education Program and Instructional Services Department of the Flint Board of Education. Called the Experimental Arithmetic Program, its purpose was to inform parents of third graders what their children were being taught in arithmetic at school and to offer suggestions as to how the parents might supplement the limited amount of individual attention and help the teachers of these children were able to give. One hundred and thirty-nine families in four elementary school neighborhoods participated in the project and once each week for thirty weeks received work kits with instructions, games, and drills. Participation in the project was not compulsory. The children's work was not considered homework as such. No work from the kits was returned to school for correction and grading. Success in working with parents was measured by comparing achievement levels of children in experimental

groups against achievement levels of children in control groups.

In this study, literature cited the importance of school-home relationships in emerging teaching concepts. The literature also cited the need for attention to individual differences in the mental growth patterns of elementary school children, and cautioned against compulsory homework in the early school years. The planners--adult education consultants, teachers, principals, and curriculum consultants--adopted these guidelines in the execution of the project.

Measurements of the effectiveness of working with parents appeared in two separate forms. One was a comparison of achievement levels of children in experimental groups with those of children in control groups composed of the two previous third-year classes in the schools in which the experiment was conducted. The Stanford Achievement test, given annually in April to all Flint third graders, was selected as a standard measuring instrument.

The second form of assessment was the Experimental Arithmetic Program Questionnaire which was distributed to participating parents. This questionnaire sought to measure the amount of time spent on the project, attitudes of both parents and children as they related to the program, to

arithmetic, and to school in general. It also asked questions pertaining to the educational and socio-economic backgrounds of the parents and made comparisons between these data and achievement levels.

Summary and Conclusions Drawn from Test Scores

From the tables and charts that have been tabulated from the data gathered, the following conclusions are apparent:

1. The six-month gain in arithmetic achievement by the experimental groups over the control groups in Schools A and B is highly significant and lends encouragement to the experiment.
2. The eight-month gain by the experimental group in School C is also highly significant and adds further encouragement.
3. The two-month gain by the experimental group in School D was not a significant difference and cannot be considered conclusive.
4. The mean five-month gain of the children in all four experimental groups over the children in all control groups in arithmetic achievement is a significant gain and supports

the program.

5. The effect of the program on reading achievement, and vice versa, is not determinable from available statistical evidence.

The reasons for the failure of School D to show a significant gain in arithmetic achievement can only be speculative. Consideration must be given to the fact that the teacher factor in this school was not constant, whereas, classes in Schools A and C had been under the same teacher for several years. In School B the experimental group and one control group were under the same teacher. It might be surmised that the longer a teacher serves in one school, the greater her familiarity with the neighborhood, its social make-up and attitudes. With this familiarity she may be able to put across with greater force--to parents through their children--work she wants to see accomplished.

Other considerations must include the low mean I.Q. score for the experimental group in School D. It leaves the question: Does this project as it is presented better serve the parents whose children have, for the greater part, average or above average I.Q.'s? Should major revisions be made in the materials used in the project if it is to be offered to parents of children who are consistently low achievers? Measurements did not clearly

reveal such a need, yet, this is a consideration which the researcher feels should not be overlooked.

Finally, we must ask if two control groups were a sufficient number to allow precise conclusions in measurement. Investigation reveals, in the case of School D, that if three control groups (the third made up of the third-year group three years previous to the experimental year) were used in making comparative measurements, the gain for the experimental group would have been a significant one. The researcher limited the investigation to include two control groups to one experimental group because the records were not complete for the third control groups in two schools.

Questionnaire Summary

It has already been stated elsewhere in this study that the parents who answered the Experimental Arithmetic Program questionnaire were not identified by name. It was felt that perhaps this would tend to present a truer picture than if the parents were under pressure to give answers they felt would reflect favorably on the family and the children. The questionnaire sought to measure different age groups, socio-economic backgrounds, as well as attitudes, and the writer realizes that true attitudes are very difficult to

measure. However, from the data tabulated, the following conclusions may be merited:

1. Very nearly all parents are eager and willing to participate in a home-school activity such as the Experimental Arithmetic Program.
2. The meetings between staff and parents, while obviously helpful in explaining and informally evaluating the program, were not essential to the program's success.
3. The take-home materials used in the Experimental Arithmetic Program were generally well accepted and understood by parents. One-third of the parents requested more specific written information from the teacher regarding their children's work.
4. While the most frequent parent participator was the mother, it is doubtful if the success of the program depended more on any one individual--mother, father, sibling, or relative--for help.
5. Families who received the greatest satisfaction from the program were those who used the materials on an irregular schedule and who accepted the project more as a "game" to be

enjoyed by both parents and children. Those who made the project a routine day to day activity did not all realize satisfaction.

6. The project was instrumental in developing improved attitudes toward arithmetic and toward school in general in more than half of the children whose parents participated.
7. Slightly over half the participating parents sensed that their children's progress in their current fourth year of school had been aided by the project. Most of these were parents whose children had a less than noteworthy record of achievement.
8. The program was effective in bringing about among participating parents an improved attitude toward school and a better understanding of how third-year arithmetic is now being taught.
9. Nearly three-fourths of the parents felt the program should be offered to all third-year children.
10. It is apparent that the Experimental Arithmetic Program was successful in motivating parent participation regardless of the frequency

parents had previously participated in other school activities.

11. In the population studied there appears to be a positive correlation between parents' performance (as measured by their children's arithmetic achievement scores) and the amount of formal education the parents had earned.
12. It cannot be plausibly stated, from the data from the population sampled, that the ages of the participating parents had a bearing on their performance in the program.
13. Although the population studied was largely of the middle class economic stratum, available data hint that a positive correlation may exist between economic levels and performance.

Implications and Recommendations

The findings of this study appear to support the hypothesis formulated for this investigation with the qualifications noted below.

The hypothesis was that if parents are systematically instructed as to specifically what their children are experiencing in a third grade arithmetic classroom, and if suggestions are made to the parents as to how they can help

their children at home, their children will show significantly greater achievement than children of parents not so instructed.

Statistics gathered from the total population studied show that the experimental groups reached an average achievement level 5.8 months higher than that of the control groups. When considered individually, the experimental groups from the four participating schools, A, B, C, and D, revealed gains of six, six, eight, and two months respectively. With a gain of three months accepted as significant, the gain made by the fourth school, although encouraging, was inconclusive for speculative reasons stated under "Summary of Achievement Scores."

Additional benefits noted were an increase in rapport between the home and the school, increased interest in arithmetic and school on the part of both parents and children. It might be argued also that reducing frustration in one key subject, arithmetic, would make for better adjusted children generally. Further, it seems that children who are working closer to their potential in a subject area tend to be interested in it, and their high interest is stimulating to the classroom teacher so that she, too, has renewed enthusiasm which, in turn, is picked up by the children and then by the parents. The causal relation-

ship in this chain may not be clearly determinable from measurements employed in the investigation, but the existence of the relationship was noted by both principals and teachers involved.

While this study indicated that the Experimental Arithmetic Program met a desire and a need of many adults who have school-going children, there are, however, certain limitations which have restricted measurement and certain adjustments which might be made for similarly-patterned adult programs.

There is a need for experimentation and measurement of the project in a more diversified population. The parents participating in the Experimental Arithmetic Program were largely in the middle class socio-economic group. Since a community normally has a varied population make-up, and it is frequent that certain elementary schools have parent populations of extremely high or low socio-economic backgrounds, it would be less than conclusive to judge the value of such a project as this if it were not offered to these varied groups and evaluated for its influence. While statistics gained from this investigation did hint of a positive correlation between performances of parents of high and low socio-economic levels, there was far too little diversification to draw out a reliable conclusion.

An effort should be made also to offer this program to parents of children who are either consistently low or high achievers. The parents selected for this experiment were those whose children were average or slightly below average in achievement. With necessary adjustments, the materials used in the Experimental Arithmetic Program might reveal other values in further accelerating the progress of high achievers in arithmetic or in arresting drift of the low achievers.

An attempt should be made to tailor the project materials for individual schools, since teaching patterns and schedules may differ slightly from one school to another. Such procedure may require more assistance from outside the classroom than was offered during this experiment. One possible solution might be to recruit some of the more conscientious parents to volunteer their services for materials preparation.

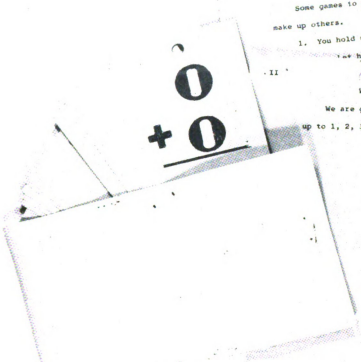
The questionnaire used for participating parents in this investigation revealed a desire to continue this program as their children progressed into the fourth, fifth, and sixth grades. This reflects not only genuine willingness of parents to help their children in their school work but also a need for workers in the field of adult education to intensify their efforts in the area of parent education.

Deficiencies in reading are heralded as widely prevalent among elementary school children across the nation. Would a parent education program, patterned after the Experimental Arithmetic Program, and directing its methods and materials toward helping parents to better understand the teaching of reading, have values equal to those found in this program? There has been much discussion in recent years on ways and means to cope with reading problems, but the researcher has found no project similar to the Experimental Arithmetic Program in content preparation and technique.

Finally, it is important that the channels of communication between parents, teachers, and consultants and especially between adult education workers and the school staff broaden. The exchange of ideas and information on problems is compulsory to the development of realistic answers to parents' educational needs. The establishment of advisory committees composed of representatives of the faculty, adult education staff, and parent groups should contribute strongly to the effectiveness of an adult education project such as the Experimental Arithmetic Program.

APPENDIX

TAKE-HOME KIT MATERIALS



The Number is Our Number

The ... is the most important number in our number ... the smallest number. We

STORY PROBLEMS

Here are some story problems for you to read and do.

... cats are ____ cats.

FLASH CARD GAMES

Some games to play with the flash cards can be these. You can make up others.

1. You hold up the cards one at a time and have your child say ... he him have one point for each one he gets right and ... the game two or three

WHAT WE ARE DOING IN SCHOOL THIS WEEK

We are going to review adding pairs of numbers that add up to 1, 2, 3, 4, 5, and 6. These are:

0	1	1	1	1	1	1
+1	+0	+1	+2	+3	+4	+5
0	2	2	2	2	2	
+2	+0	+1	+2	+3	+4	
0	3	3	3	3		
+3	+0	+1	+2	+3		
0	4	4	4			
+4	+0	+1	+2			
0	5	5				
+5	+0	+1				
0	6					
+6	+0					

We will show ways to add by using objects, by drawing pictures, and by writing the numbers. We will talk about the meaning of each figure when we have two figures in a number, as in 54, where the 4 on the right means four one's and the 5 on the left means five ten's. We will talk about the meaning of zero--0--which is nothing and also how zero holds the place for numbers 1, 2, 3, 4, 5, 6, 7, 8, and 9. We will also learn again that we can only add things or groups of things that are like each other; that is, we cannot add lions and dogs, or pennies and birds but we can add, for example, lions and lions.

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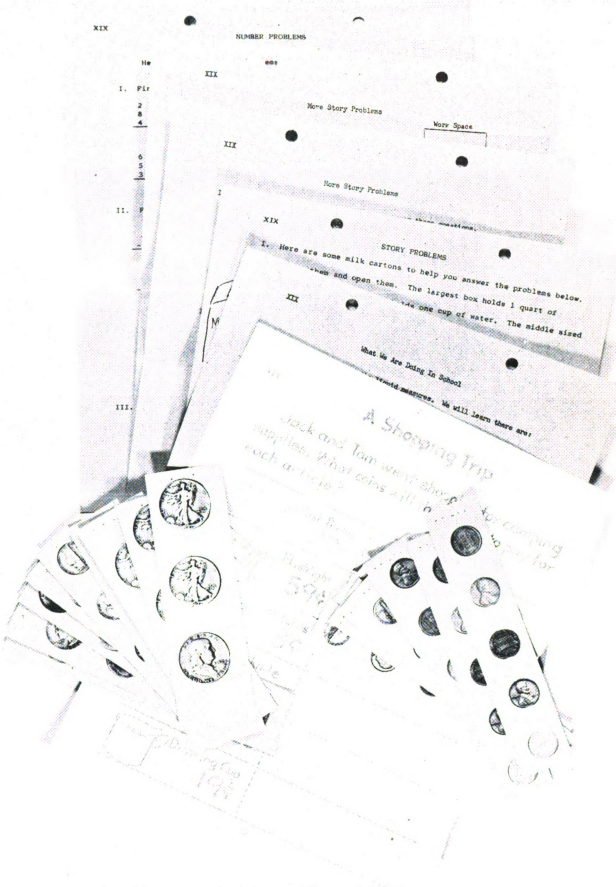
NUMBER PROBLEMS
More Story Problems
Work Space
More Story Problems
STORY PROBLEMS
What We Are Doing In School
A Shopping Trip

XXV

XXV

NUMBER PROBLEMS CONTINUED

XXV

6

STORY PROBLEMS

1. Each child in Mrs. Fisher's class reads 3 library books a week. How many books will each child read in 7 weeks?

XXV

WHAT WE ARE DOING IN SCHOOL

II subtract 3 place numbers from 3 place numbers. Some problems will require borrowing from the 100's figure

problems will require borrowing from the 100's and as in:

[Step 2]

[Step 3]

problems that require subtraction. We act when

ference between 2 numbers

things such as the length of two boards

ng is more or less than another

Doing problems which add up

III. We to a

(We will be right rows.)

our answers in the

7224-6 Printed

KUHLMANN-ANDERSON TEST

Booklet **B**

Kuhlmann-Anderson Test

SEVENTH EDITION

NAME .....

GRADE ..... BOY ..... GIRL .....

TEACHER .....

SCHOOL ..... CITY .....

DATE TESTED ....
Year Month Day

DATE OF BIRTH ....
Year Month Day

AGE [ ] — [ ] [ ]
Years Months Days

Test Results	—					—
	CA Yrs. Mos.*	Total Score	PR	Quotient	PR	MA† Yrs. Mos.

Test administered by .....

Test scored by .....

Comments: .....

.....

SCORE

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
T ____

** Add 1 month to CA for 16 days or more.*
† Derive MA from CA and IQ, using IQ KAlculator.

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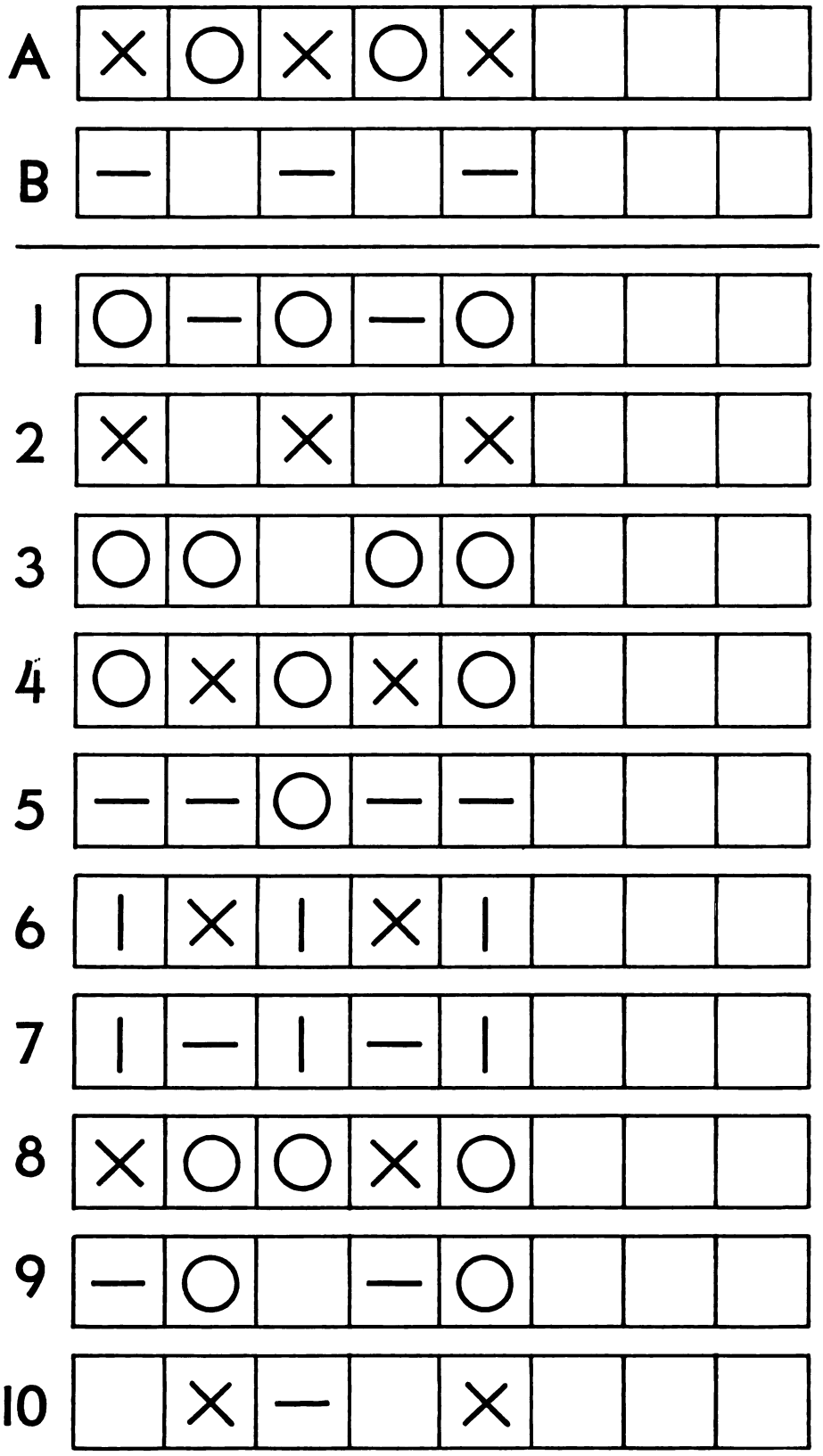
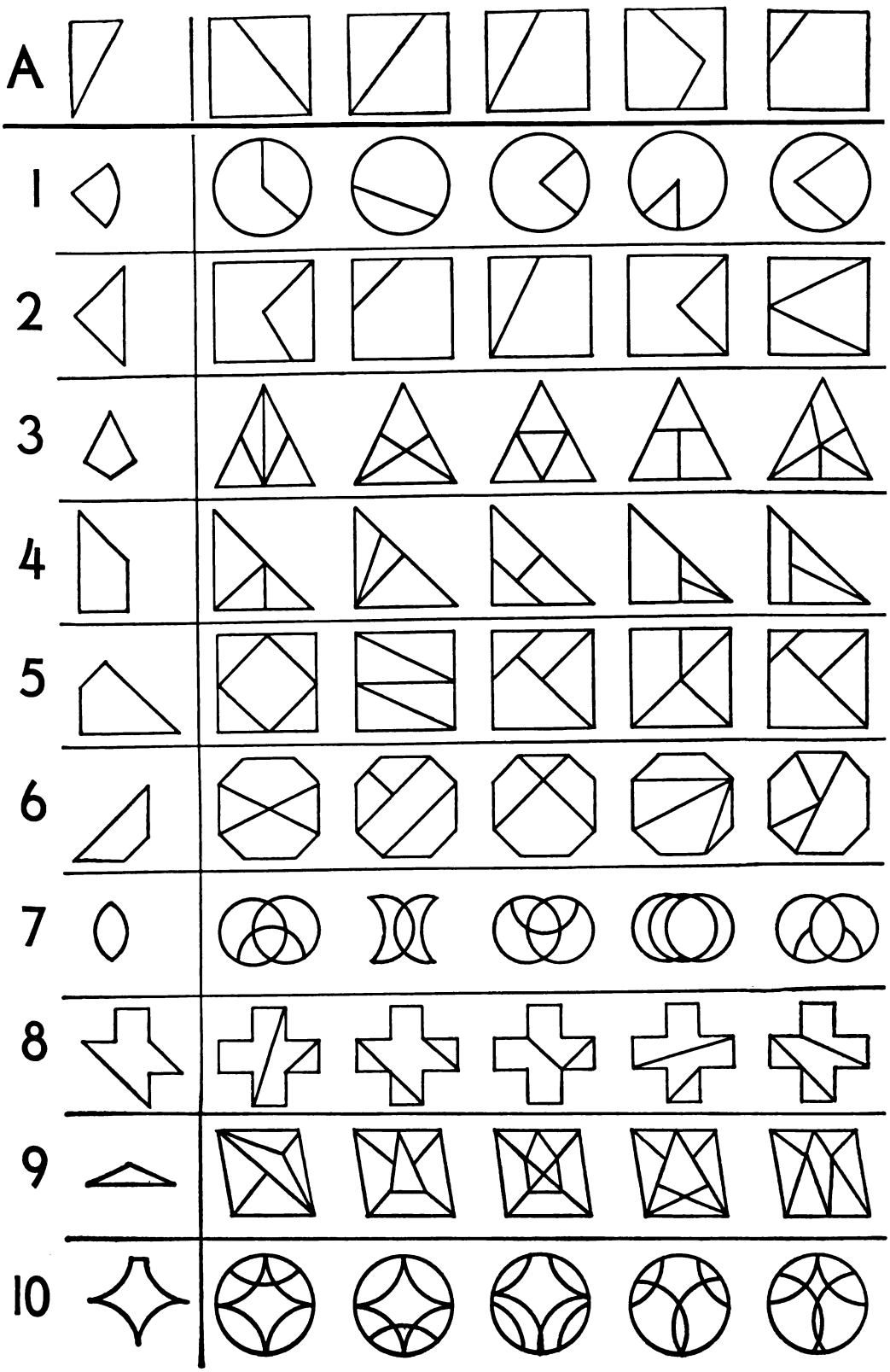
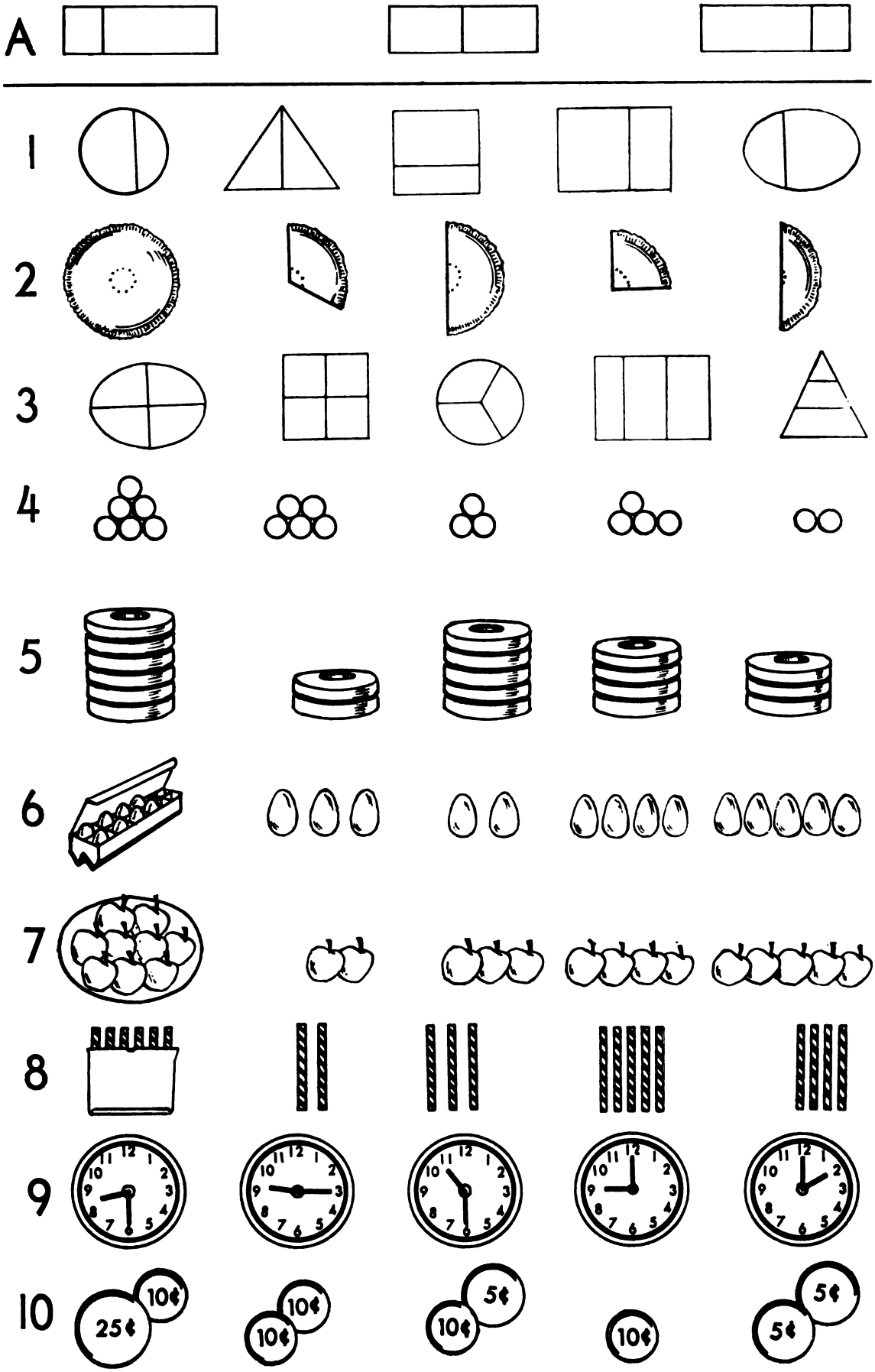
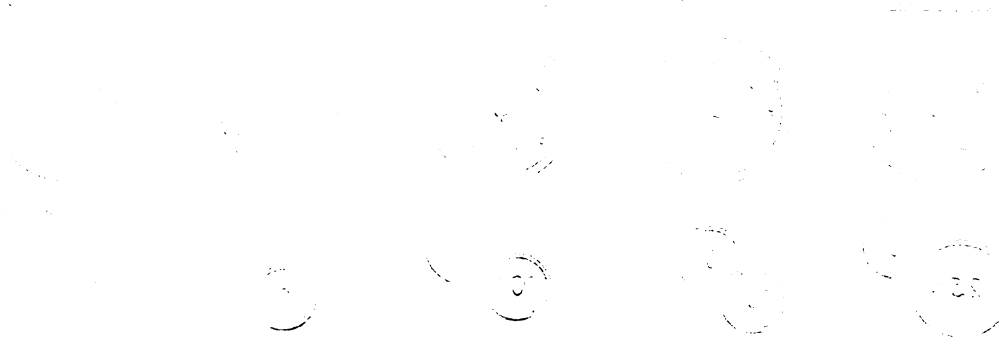
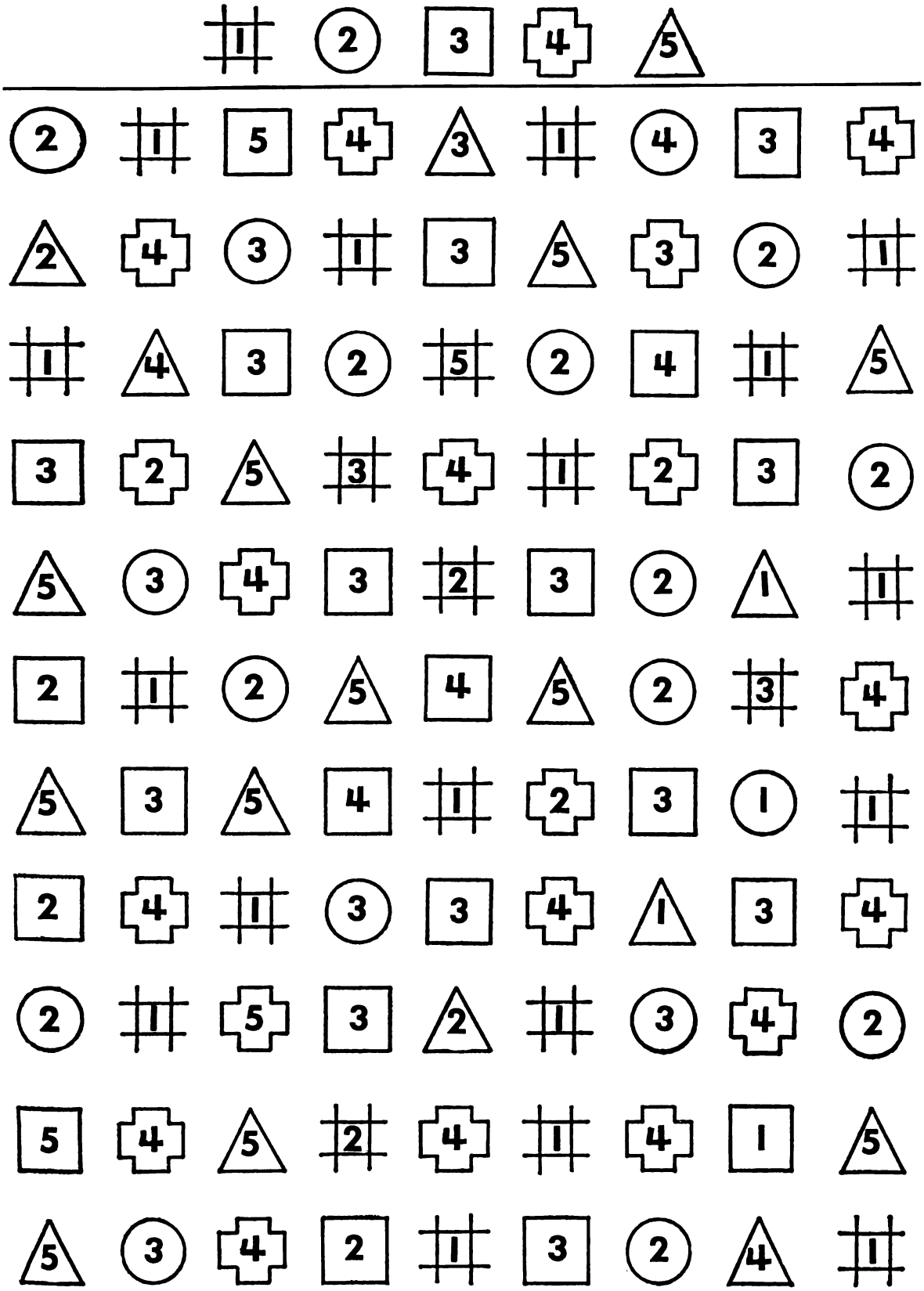


Test B1


A
1
2
3
4
5
6
7
8
9
10


A
1
2
3
4
5
6
7
8
9
10
25¢
10¢
10¢
10¢
5¢
10¢
10¢
5¢
5¢




1 2 3 4 5
2 1 5 4 3 1 4 3 4
2 4 3 1 3 5 3 2 1
1 4 3 2 5 2 4 1 5
3 2 5 3 4 1 2 3 2
5 3 4 3 2 3 2 1 1
2 1 2 5 4 5 2 3 4
5 3 5 4 1 2 3 1 1
2 4 1 3 3 4 1 3 4
2 1 5 3 2 1 3 4 2
5 4 5 2 4 1 4 1 5
5 3 4 2 1 3 2 4 1

Test B6

EXAMPLES:

Y-B-O _____

R-N-A _____

---

1. O-C-W _____
2. X-B-O _____
3. B-Y-A-B _____
4. N-M-A _____
5. G-L-R-I _____
6. M-O-S-U-E _____
7. V-H-A-E _____
8. K-O-B-O _____
9. H-T-E-M _____
10. L-A-B-L _____
11. N-B-U-M-E-R _____
12. I-C-H-D-L _____
13. T-W-A-E-R _____
14. P-E-P-A-R _____
15. P-N-I-L-C-E _____

1	2	3	4	5	6	7	8	9
A	E	U	B	D	G	C	F	H

EXAMPLES:

X. 1 6 2 _____

Y. 8 1 7 2 _____

1. 9 1 5 _____
2. 5 3 6 _____
3. 8 2 5 _____
4. 4 3 6 _____
5. 5 3 2 _____
6. 4 1 6 _____
7. 4 2 1 5 _____
8. 8 1 5 2 _____
9. 9 3 6 2 _____
10. 2 1 7 9 _____
11. 7 3 4 2 _____
12. 7 1 8 2 _____
13. 1 7 9 2 _____
14. 4 3 5 6 2 _____
15. 7 9 1 8 2 _____

STANFORD ACHIEVEMENT TEST

Elementary Battery | FORM J

STANFORD ACHIEVEMENT TEST

TRUMAN L. KELLEY • RICHARD MADDEN • ERIC F. GARDNER • LEWIS M. TERMAN • GILES M. RUCH

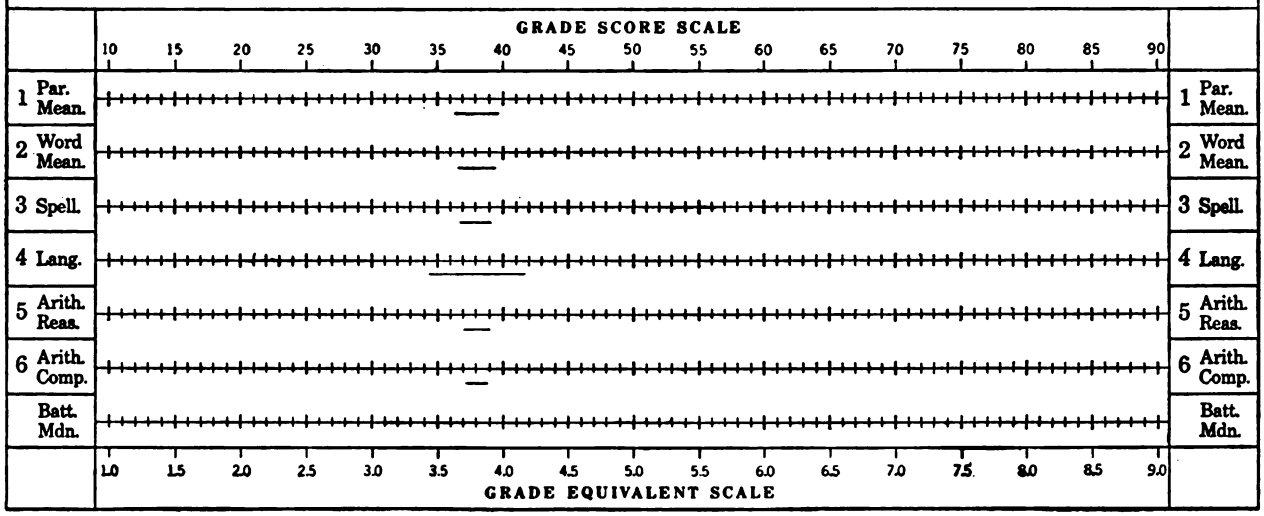
Name_____ Age_____ Grade_____ Boy or girl_____

Teacher_____ School_____ Date of birth_____ _____ _____
Year *Month* *Day*

City or Town_____ State_____ Date_____

	1 PAR. MEAN.	2 WORD MEAN.	AVER. READ.	3 SPELL.	4 LANG.	5 ARITH. REAS.	6 ARITH. COMP.	AVER. ARITH.	BATTERY MEDIAN
Grade Equiv.									
Age Equiv.									
%-ile Rank									

Individual Profile Chart



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SAT: ELEM.: J-19

a

TEST 1 *Paragraph Meaning*

DIRECTIONS: Find the word that belongs in each space, and draw a line under it. Do *not* write in the spaces.

SAMPLE:

Wheat grows on farms. Most bread is made from wheat. If farmers did not plant __51__, most people would have no __52__ to eat.

51. **corn** **potatoes** **rice** **wheat**

52. **oranges** **bread** **carrots** **eggs**

Mary and John live in a big __1__.

1. **tree** **house** **farm** **yard**

See them laugh.
Something is __2__.

2. **funny** **red** **big** **out**

Frank wanted to go out to play, but his mother said it was too wet outdoors. Frank looked out the window and saw that his mother was right. The __3__ was falling fast.

3. **night** **rain** **storm** **cold**

The little boy can throw a ball, but he cannot __4__ it.

4. **make** **catch** **swing** **eat**

We have a small pony.
We always try not to __5__ it.

5. **ride** **see** **hurt** **feed**

Helen was sick. The girls at school wrote her a letter. "Dear Helen," they said, "We hope you will soon feel __6__ enough to come back to __7__."

6. **well** **happy** **nice** **glad**

7. **church** **visit** **school** **town**

Mother frogs lay their eggs in the water. The __8__ hatch into tiny tadpoles that can breathe under the __9__ the way fish do.

8. **frogs** **toads** **eggs** **animals**

9. **rocks** **water** **neck** **body**

The children went to the circus. They saw elephants, monkeys, and many other animals. There were many clowns and lots of popcorn and peanuts. The children said that they wished a __10__ would come every day.

10. **parade** **clown** **circus** **monkey**

You can often find shells along the edges of rivers and lakes. An even better place to pick up __11__ is by the ocean.

11. **seaweed** **shells** **rocks** **sand**

Tom and Jane had for a pet a white mouse called Mickey. The children were fond of Mickey and took him on their vacation trips. They both took care of him. It was Tom's job to keep the cage nice and clean, and it was __12__ duty to see that the __13__ got plenty of the right kind of food.

12. **his** **their** **Mickey's** **Jane's**

13. **mouse** **children** **mice** **kitten**

When Mary was ten years old, she was given ten cents a week. Her brother Tom, who was twelve, got twenty-five cents a week. Mary asked her father why she could not have as much as Tom. Her father replied, "When you are as old as Tom is now, you may have just as much as he gets now." Two years later, when Mary reached her __14__ birthday, her father said, "Now you may have __15__ cents a __16__."

14. **next** **tenth** **eleventh** **twelfth**

15. **five** **ten** **twenty** **twenty-five**

16. **day** **month** **week** **year**

Go on to the next page.

TEST 1 *Paragraph Meaning* (Continued)

We went up in an airplane. At first we flew near the __17__ where we could see people and animals. Later we could not see them. Our plane was flying too __18__.

17. houses ground town hills
18. high low far fast

A long time ago farmers used sharp sticks instead of plows to dig up the earth. Now they have steel __19__ pulled by horses or tractors. They can cultivate large fields and raise big __20__.

19. tools plows machines forks
20. tomatoes corn plants crops

In the back of most books is an index that tells you on what page to look for any subject written about in the book. John wanted to know about bears. He looked in a book about animals and found the right __21__ by looking in the __22__ under "B."

21. idea spot letter page
22. index front book printing

On Saturday Mother gets groceries. She buys __23__ from the butcher. She buys vegetables at the market and __24__ and cookies at the bakery. She buys enough __25__ of all kinds to last until Monday.

23. bananas meat potatoes candy
24. oatmeal fruit bread candy
25. food packages meat dessert

The shaking of hands with the right hand started in the days when everybody carried a sword or a knife. In those days when one met a stranger he would hold out his __26__ hand to show that he was friendly and didn't have a __27__ or a __28__ ready for attack.

26. free right left nearest
27. sword spear weapon stick
28. fist gun knife club

There are three kinds of bees in a hive — the queen bee, the worker bees, and the drones. The queen bee is the mother who lays the eggs. The busy workers gather honey. The __29__ do not do any work at all.

29. bees queens females drones

Insects that fly at night often make mistakes. They cannot tell the light of the moon from that given by an open fire. Sometimes these __30__ fly into a __31__ and are killed.

30. bees birds moths insects
31. flame house window car

The gold used for jewelry is mixed with some other metal, making an alloy. Pure gold is very soft and jewelry made of it would not wear well. Therefore copper, or some other __32__, is mixed with the pure gold to make it __33__.

32. mineral metal material chemical
33. brighter prettier softer harder

I go to bed at seven o'clock. Tom stays up until eight. We both arise at seven o'clock in the morning. Tom sleeps an hour __34__ than I do.

34. longer more later less

The so-called falling stars that we see are not really stars at all but are meteors. Occasionally they fall all the way to our earth, and sometimes they may be picked up. By far the greater number of these __35__, however, never reach the __36__ because they are burned up or broken up into dust by the friction of the earth's atmosphere.

35. planets stars meteors comets
36. air earth stratosphere solar system

Go on to the next page.

TEST 1 *Paragraph Meaning* (Continued)

Here is the way to lay a brick walk in a garden. Dig a path 4 inches deep. Pack and roll down 2 inches of sand. Lay in place __37__ 2½ inches thick. Your finished walk will be just a little __38__ ground level.

37. **cement** **boards** **bricks** **dirt**
38. **above** **below** **nearer** **beneath**

When we become angry or afraid, our hearts begin to beat rapidly. Our muscles feel tight. Our bodies get ready to fight or run, even though we do not really need to do either. Afterward, we feel as tired as though we had actually __39__ or __40__.

39. **slept** **eaten** **run** **awakened**
40. **rested** **fought** **slept** **read**

Wool is clipped from live sheep by a process called shearing. The entire mat of fleece from each animal comes off in one piece. With electric clippers one man can __41__ from 150 to 200 __42__ a day. After shearing, the __43__ is rolled up in bundles and sent to the mill.

41. **clip** **run** **kill** **feed**
42. **pounds** **lambs** **pelts** **sheep**
43. **skin** **hide** **fleece** **cotton**

A bottle used to be made by a glass blower with a long pipe through which he blew air into a bubble of hot liquid glass. Now the work is done by a machine which revolves over a pot of melted __44__, sucks up the amount needed, shapes it on a mold, and blows it out. A workman operating a __45__ can produce ten times as many __46__ in an hour as an old-fashioned glass blower could.

44. **metal** **iron** **glass** **ice**
45. **blower** **machine** **factory** **pipe**
46. **pipes** **balls** **bottles** **glasses**

A few years ago most freight was carried by railroad trains. Now such things as furniture and automobiles are sent across country on trucks. Goods sent by __47__ can go only where __48__ have been laid, but goods sent by __49__ can reach any point to which a __50__ runs.

47. **truck** **rail** **freight** **express**
48. **roads** **paths** **tracks** **highways**
49. **truck** **freight** **rail** **express**
50. **drive** **trail** **track** **road**

Stop.

No. RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Gr. score	below 10			10	12	14	15	16	17	18	20	21	22	23	24	25	26	27	28	29	30	30	31	32	33	34	35	36	37	38	39	40	42	43	44	46	48	50	52	55	57

No. RIGHT	41	42	43	44	45	46	47	48	49	50
Gr. score	60	63	67	71	76	81	86	93	99	

TEST 2 *Word Meaning*

DIRECTIONS: Draw a line under the one word that makes the sentence true, as shown in the first sample. Look at all four words and choose the best one.

SAMPLES:

The name of a color is
farm milk red pet

The day that comes after Friday is
Monday Tuesday Saturday Sunday

1 Eggs come from
cattle hens horses pigs

2 We laugh when we are
mean happy warm pretty

3 Ice is made from
plants water salt glass

4 A room is part of
a yard an auto a sled a building

5 If Mary is with Jane, they are
tired talking scared together

6 I am a
table sheep child baby

7 We find water in
rocks lakes bushes boxes

8 March is the name of a
day week month year

9 Above means
over under clear many

10 A grape is a
rose business fruit drink

11 An onion is a
vegetable bean berry weed

12 Your arm is a part of your
hand coat leg body

13 A pair means **many one two three**

14 To arise is to
get up rest shine awake

15 One of the seasons is
year night sunshine winter

16 Mary Smith and John Doe are cousins if they have the same
grandmother mother sister daughter

17 Queer means
strange bright old pleasant

18 A surprise happens
often seldom suddenly loudly

19 A feast is a **plate meal crown dance**

20 Around means **next under alone about**

21 To vanish is to
disappear examine shape paint

22 When you fear that something bad may happen, you are
ashamed merry angry worried

23 Marvelous means
pleasant distant wonderful great

24 A customer is one who
plants works buys learns

25 When you connect two railroad cars, you
push them join them lift them run them

26 People are most likely to talk loudly when they are **sorry excited sleepy satisfied**

27 The person who dances with you is your
guest helper prisoner partner

28 Something made of iron is
silver metal copper gold

29 The way a person looks is his
appearance burden conduct difficulty

30 To be content is to be
faithful satisfied free fair

31 A wide city street lined with trees is often called
an avenue a highway a route a railway

32 To lash is to
deceive destroy waste whip

33 If you save things carefully, you are
nasty mean selfish thrifty

34 A river three miles across is
swift narrow broad shallow

35 News tells about something which happened
yesterday recently once long ago

36 A thing is gigantic if it is
very important huge exploded far away

37 Things which are much alike are
equal handsome similar opposite

38 A place that raises flowers and shrubs to sell is called a
nursery plantation garden ranch

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Gr. score	13	14	15	16	17	18	19	20	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	38	39	40	41	42	43	44	46	49	51	54	57	61	66	71

Stop.

TEST 3 *Spelling*

1. _____ 26. _____
2. _____ 27. _____
3. _____ 28. _____
4. _____ 29. _____
5. _____ 30. _____
6. _____ 31. _____
7. _____ 32. _____
8. _____ 33. _____
9. _____ 34. _____
10. _____ 35. _____
11. _____ 36. _____
12. _____ 37. _____
13. _____ 38. _____
14. _____ 39. _____
15. _____ 40. _____
16. _____ 41. _____
17. _____ 42. _____
18. _____ 43. _____
19. _____ 44. _____
20. _____ 45. _____
21. _____ 46. _____
22. _____ 47. _____
23. _____ 48. _____
24. _____ 49. _____
25. _____ 50. _____

No. RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Gr. score	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	29	30	31	32	32	33	34	35	35	36	37	38	38	39	40	41	42	43	44	45	46	47	49	50	52	54	55	57	59	61	63	65	68

TEST 4 *Language*

◀ 7a

◀ 7b

DIRECTIONS: In each pair of words in heavy type in the letter below there is an error in either capitalization or punctuation. You are to decide which one of each pair has the correct capitalization and punctuation. Then mark the answer space at the right that has the same number as the correct form.

SAMPLES: This is 1 **mr. Jones.** 2 **Mr. Jones.** ..... 1 2 ▮

3 **St. Louis, Missouri** 4 **St. Louis Missouri** 3 4

---

1 **654 Magnolia, Avenue** 2 **654 Magnolia Avenue** 1 2 1

3 **Fort Lyon, 15, Georgia** 4 **Fort Lyon 15, Georgia** 3 4 2

5 **Sept. 8, 1953** 6 **Sept 8, 1953** 5 6 3

1 **Dear Dick,** 2 **Dear Dick—** 1 2 4

Can you come to my 3 **birthday** 4 **Birthday** 3 4 5

party on 5 **saturday** 6 **Saturday** at about half 5 6 6

past 1 **twelve.** 2 **twelve?** We will listen 1 2 7

to 3 **"Treasure Island"** 4 **"treasure island"** on the record 3 4 8

that you gave me last 5 **july.** 6 **July.** 5 6 9

Mother said, 1 **"you** 2 **"You** may ask 1 2 10

any five boys you 3 **wish.** 4 **wish."** 3 4 11

5 **I'm** 6 **Im** going to invite my 5 6 12

1 **cousin** 2 **Cousin** who used to live in 1 2 13

3 **Chicago,** 4 **chicago,** my friend who lives 3 4 14

on 5 **Wilson street,** 6 **Wilson Street,** and 5 6 15

three other 1 **friends.** 2 **friends,** 1 2 16

3 **please** 4 **Please** let me know sometime 3 4 17

5 **tomorrow** 6 **Tomorrow** if you can come 5 6 18

1 **Your friend.** 2 **Your friend,** 1 2 19

3 **Mike.** 4 **Mike** 3 4 20

DIRECTIONS: Each exercise below has two numbered parts. One part is written well and makes good sense. The other is written poorly. Choose the good one and mark the answer space which has the same number as your choice.

SAMPLE: 1 We'll go when you are ready. 2 We'll go. When you are ready. 1 2

---

1 We ate lunch with some friends. 2 We ate lunch. With some friends. 1 2 21

3 When you learn to swim. 4 When will you learn to swim? 3 4 22

5 A plane flies over the land. 6 A plane high over the land. 5 6 23

1 At last the fire has gone out. 2 Until the fire has gone out. 1 2 24

3 Someone broke a bottle. Right here on the sidewalk. 4 Someone broke a bottle right here on the sidewalk. 3 4 25

---

1 We boys play on the sidewalk. When we get home from school. 2 We boys play on the sidewalk when we get home from school. 1 2 26

3 Sometimes coast in our wagons. 4 Some of us coast in our wagons. 3 4 27

5 Others ride bicycles. 6 Or ride bicycles. 5 6 28

1 Everybody goes on wheels. 2 Everybody going on wheels. 1 2 29

3 To have lots of fun. 4 We have lots of fun. 3 4 30

---

1 Bill has a bird that knows how to talk. 2 Bill has a bird. That knows how to talk. 1 2 31

3 He bought it from a sailor it is called a myna bird. 4 He bought it from a sailor. It is called a myna bird. 3 4 32

5 It can say "Hello." Call people by name. And answer questions. 6 It can say "Hello," call people by name, and answer questions. 5 6 33

1 It calls, "Hello, Bobby," whenever I come in. 2 It calls, "Hello, Bobby." Whenever I come in. 1 2 34

TEST 4 *Language* (Continued) ◀8a ◀8b

DIRECTIONS: In each sentence, decide which of the numbered words is correct. Then mark the answer space at the right which has the same number as the word you have chosen.

SAMPLE: Apples 1 is / 2 are good. 1 2

Soon it 1 began / 2 begun to rain. 1 2 35

I 3 said / 4 says to Jim, "Just try it." 3 4 36

5 My father he / 6 My father told me to come. 5 6 37

My little sister 1 seen / 2 saw a bear. 1 2 38

Yesterday Jack 3 came / 4 come home early 3 4 39

I 5 brung / 6 brought my lunch today. 5 6 40

Miss Brown 1 sat / 2 set over there. 1 2 41

I used to 3 could / 4 be able to sing better. 3 4 42

Sam 5 ain't / 6 isn't here today. 5 6 43

1 Let / 2 Leave me have a turn now. 1 2 44

Bob and 3 I / 4 me painted the scenery. 3 4 45

Give Tom 5 that there / 6 that sandwich. 5 6 46

Ned wants to do it 1 hisself. / 2 himself. 1 2 47

Will you 3 teach / 4 learn me to jump rope? 3 4 48

Sally 5 drawed / 6 drew a picture of a cow. 5 6 49

Don't you want 1 no more / 2 any more ice cream? 1 2 50

I 3 broke / 4 busted my fishing pole. 3 4 51

Jane 5 swam / 6 swum across the pool. 5 6 52

Please 1 take / 2 bring this note to your mother. 1 2 53

Three of 3 we / 4 us boys got caught. 3 4 54

Stand 5 hear / 6 here beside me. 5 6 55

We all 1 clumb / 2 climbed over the fence. 1 2 56

John didn't give us 3 any / 4 no paper. 3 4 57

Mary has 5 gone / 6 went to the park. 5 6 58

A boy 1 doesn't / 2 don't like to sit still. 1 2 59

Where did you buy 3 them / 4 those socks? 3 4 60

Where 5 are / 6 is my books? 5 6 61

My mother should 1 have / 2 of told me. 1 2 62

I've 3 did / 4 done my arithmetic. 3 4 63

There 5 were / 6 was five cookies in the jar. 5 6 64

My aunt gave me 1 a / 2 an apple. 1 2 65

The children have done 3 there / 4 their jobs. 3 4 66

Sit down and rest 5 your / 6 you're feet. 5 6 67

All of us wanted to go 1 bad. / 2 badly. 1 2 68

Nancy can certainly read 3 good. / 4 well. 3 4 69

The grass has 5 grown / 6 growed an inch. 5 6 70

1 Hadn't you ought to / 2 Shouldn't you use a broom? 1 2 71

We have already 3 choosed / 4 chosen sides. 3 4 72

Have you 5 written / 6 wrote to Helen? 5 6 73

Our team will win this game 1 easy. / 2 easily. 1 2 74

Stop.

No. right ( ) × 2 ( )

No. omitted or double marked ( )

DIFFERENCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Gr. score							below 10			10	11	12	13	14	15	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	

DIFFERENCE (Cont'd)	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
Gr. score	39	40	41	42	43	45	46	47	49	50	52	53	55	57	58	60	62	64	65	67	69	71	73	74	76	78	80	83	85	88	92	97	102	108

Sum ( )

Subtract 74

DIFFERENCE .....

TEST 5 *Arithmetic Reasoning*

DIRECTIONS: Find the answers to these problems as quickly as you can. Write the answer for each problem on the dotted line at the right of the problem. In problems of buying, pay no attention to a sales tax. Use a separate sheet to figure on.

PART I

1 How many cars are 1 car and 3 cars? ------

2 There were 4 boys and 4 girls playing in the sand. How many boys and girls were playing all together? ------

3 Tom has 3 gray kittens and 5 black ones. How many kittens has he in all? ------

4 Jane brought 3 dolls, Ellen brought 4, and Sue brought 2. How many dolls did all of them bring? ------

5 Ann invited 9 children to her party, but 4 did not come. How many came? ------

6 Beth has 2 books, Mary has 3 books, and Jean has 2 books. How many books have all three girls? ------

7 There are 8 apples on the table. If we eat 5 of them, how many will be left? ------

8 There were 9 children playing. Then 3 went home. How many were left? ------

9 Hazel made 12 cakes for the party. Ruth made 7 and Joan made 24. How many cakes did they all make? ------

10 Three dimes and two nickels are how many cents? ------

11 Fred sold 6 papers, Ted sold 13, and Dick sold 15. How many did all of them sell? ------

12 Jane has 13 coloring pencils and Dot has 5. If Sue buys a box of 12 pencils, how many will all three girls have? ------

13 Judy has 16 jacks and Hazel has 9. How many more jacks has Judy than Hazel? ------

14 We counted 11 carrots in one row of the garden, 6 carrots in another, and 15 carrots in another. How many carrots are there in the 3 rows? ------

15 Dick earned 7 dollars. His work is one third done. How many dollars are 3 times 7 dollars? ------

16 Bill set out 26 lettuce plants which died. He set out 34 which lived. How many plants did he set out all together? ------

17 Helen's mother has 28 cookies in the oven. There are 35 more to be baked. How many cookies will there be all together? ------

18 Tom read 6 pages yesterday. In 3 days, he will read three times as many pages. How many will that be? ------

19 Grace bought a book for 38 cents. She gave the clerk 50 cents. How many cents change should she have received? ------

20 Dan's kite string was 100 feet long. He cut off 42 feet and gave it away. How many feet of string did he have left? ------

21 Mother bakes 24 buns at a time. How many pans will she need if she bakes 6 in a pan? ------

22 The pet shop has 3 black kittens and 5 black puppies. It also has 4 white kittens and 5 brown puppies. How many kittens has the shop? ------

23 Bob's mother had 7 quarts of ice cream. The boys ate a gallon. How many quarts were left? ------

24 Father drives 18 miles each day. How many miles will he travel in 5 days? ------

Go on to the next page.

TEST 5 *Arithmetic Reasoning* (Continued)

25 Four girls agreed to try to sell 144 boxes of candy to raise money to attend summer camp. How many boxes must each girl sell if they divide them equally? ------

26 A rancher wants to divide his herd of 184 cows into 2 equal groups. How many cows will he put in each group? ------

27 The 6 members of a stamp club have 432 stamps in all. What is the average number of stamps a member has? ------

28 A cake costs 73 cents. How many cents will Mother get back if she gives the baker 2 half dollars? ------

29 A lock for the clubhouse will cost $1.35. How many cents will each boy pay if 9 boys share equally? ------

30 Bob's coin book holds 48 coins on each page. How many coins will it hold on all 24 pages? ------

PART II

31 How many cookies are there in a dozen? ------

32 Write the one of these that is used to show time:

lb. hr. oz. $ ------

33 Write the number that would come next:

70 80 90 ? ------

34 Write *two hundred three* in numbers. ------

35 Which is the largest of these numbers?

402 89 346 198 ------

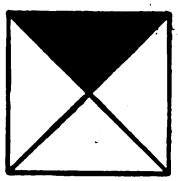
36 What number is written under the space where Thursday (Thurs.) should be? ------

MAY						
Sun.	Mon.					Sat.
1	2	3	4	5	6	7

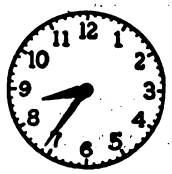
37 Write *one-third* in numbers. ------

38 How many ounces are there in a pound of meat? ------

39 A yard is how many inches? ------

40 

Write the fraction that tells what part of this square is black. ------

41 

How many minutes until nine o'clock is it by this clock? ------

42 One of these numbers tells you about how many pounds a quart of milk weighs. Write the number in the space.

2 5 9 15 ------

43 Which is the largest?

$\frac{2}{3}$ $\frac{2}{6}$ $\frac{2}{8}$ $\frac{2}{10}$ ------

44 Write the Roman numeral XIV in figures. ------

45 Here is part of a train timetable. How many minutes does it take for the train to go from Center to Hill? ------

TOWN	TIME
Wood . . .	3:50
Center . . .	4:10
Oak	4:20
Hill	4:40

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	54	56	58	61	64	67	70	73
Gr. score	14	15	17	18	19	21	22	23	24	26	27	28	29	30	31	32	33	34	35	36	37	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	54	56	58	61	64	67	70	73																

Stop.

TEST 6 *Arithmetic Computation*

DIRECTIONS: Look at each example carefully to see what you are to do. Do the examples and copy your answers in the column marked "**Answers**" at the right.

SAMPLE A

$$\begin{array}{r} 2 \\ +2 \\ \hline 4 \end{array}$$

SAMPLE B

$$\begin{array}{r} 6 \\ -1 \\ \hline 5 \end{array}$$

1

$$\begin{array}{r} 3 \\ +5 \\ \hline \end{array}$$

2

$$\begin{array}{r} 4 \\ +6 \\ \hline \end{array}$$

3

$$\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$$

4

$$\begin{array}{r} 2 \\ +7 \\ \hline \end{array}$$

5

$$\begin{array}{r} 9 \\ -4 \\ \hline \end{array}$$

6 Add

$$\begin{array}{r} 3 \\ 2 \\ 4 \\ \hline \end{array}$$

7

$$\begin{array}{r} 7 \\ -5 \\ \hline \end{array}$$

8

$$\begin{array}{r} 60 \\ +29 \\ \hline \end{array}$$

9

$$\begin{array}{r} 85 \\ -20 \\ \hline \end{array}$$

10

$$\begin{array}{r} 96 \\ -32 \\ \hline \end{array}$$

11

$$\begin{array}{r} 45 \\ +63 \\ \hline \end{array}$$

12

$$\begin{array}{r} 47 \\ -2 \\ \hline \end{array}$$

13

$$\begin{array}{r} 69 \\ -67 \\ \hline \end{array}$$

14 $16 - 7 =$

15

$$\begin{array}{r} 2 \\ \times 3 \\ \hline \end{array}$$

16

$$\begin{array}{r} 268 \\ +423 \\ \hline \end{array}$$

17 $48 + 7 =$

18

$$\begin{array}{r} 129 \\ -96 \\ \hline \end{array}$$

19 $2\overline{)4}$

20

$$\begin{array}{r} 84 \\ \times 2 \\ \hline \end{array}$$

21

$$\begin{array}{r} \$7.68 \\ +4.90 \\ \hline \$ \end{array}$$

22

$$\begin{array}{r} 124 \\ \times 4 \\ \hline \end{array}$$

Answers

A 4

B 5

1 ---

2 ---

3 ---

4 ---

5 ---

6 ---

7 ---

8 ---

9 ---

10 ---

11 ---

12 ---

13 ---

14 ---

15 ---

16 ---

17 ---

18 ---

19 ---

20 ---

21 $---

22 ---

Go on to the next page.

TEST 6 *Arithmetic Computation* (Continued)

23

$6 \times 9 =$

24 Add

297
48
730
65

25

$$\begin{array}{r} 422 \\ -\ 385 \\ \hline \end{array}$$

26

$3\overline{)156}$

27

$$\begin{array}{r} 205 \\ \times\ 7 \\ \hline \end{array}$$

28 Add

7464
5785
4968

29

$24 \div 4 =$

30

$$\begin{array}{r} 600 \\ -\ 546 \\ \hline \end{array}$$

31

$$\begin{array}{r} \$2.26 \\ -\ 2.08 \\ \hline \$ \end{array}$$

32

$$\begin{array}{r} 215 \\ -\ 176 \\ \hline \end{array}$$

33

$$\begin{array}{r} \$6.85 \\ \times\ 9 \\ \hline \$ \end{array}$$

34

$$\begin{array}{r} 63 \\ \times\ 14 \\ \hline \end{array}$$

35

$3\overline{)1824}$

36

$$\begin{array}{r} 85 \\ \times\ 50 \\ \hline \end{array}$$

37

$34\overline{)68}$

38

$$\begin{array}{r} \frac{2}{5} \\ +\ \frac{1}{5} \\ \hline \end{array}$$

39

$5\overline{)\$4.29}$

40

$$\begin{array}{r} 3470 \\ \times\ 69 \\ \hline \end{array}$$

41

$$\begin{array}{r} 806 \\ \times\ 870 \\ \hline \end{array}$$

42

$73\overline{)2350}$

Answers

23 ----------
24 ----------
25 ----------
26 ----------
27 ----------
28 ----------
29 ----------
30 ----------
31 $ ----------
32 ----------
33 $ ----------
34 ----------
35 ----------
36 ----------
37 ----------
38 ----------
39 $ ----------
40 ----------
41 ----------
42 ----------

Stop.

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Gr. score	15	17	19	20	21	23	24	25	26	27	28	28	29	30	31	32	33	34	35	36	37	38	38	39	40	41	42	43	44	45	47	48	50	51	52	54	56	57	59	61	64	69

LETTER TO PARENTS

Flint Community Schools

FLINT, MICHIGAN

February 19, 1964

Dear Parents:

Last year while your child was enrolled in the third year at Freeman School, we conducted an experimental program to test an idea we hoped might improve his understanding of arithmetic. This project was called the Experimental Arithmetic Program. We hope you recall the materials your child brought home weekly--lesson plans, suggestions for study and practice, flash cards and games.

We want to learn more about the effectiveness of this program than we have already learned from the achievement scores of children who participated. We want to find out how you felt about the project. What did you think was worthwhile and what was not? The accompanying questionnaire asks these questions. There also are a few questions of a personal nature, to give us background information. I hope you won't mind completing these questions to assure that we will have valid and helpful data for a complete evaluation of the program.

It would be appreciated if you would complete the questionnaire at your earliest convenience and have your child return it to his teacher. A return envelope has been enclosed.

Thank you very much for your cooperation.

Sincerely,

Louis J. Scieszka
Principal

PS: <u>The child's mother or father or both may fill out the questionnaire and all the information you give us will be kept confidential. Your name will not appear on the questionnaire</u>.

EXPERIMENTAL ARITHMETIC PROGRAM QUESTIONNAIRE

EXPERIMENTAL ARITHMETIC PROGRAM QUESTIONNAIRE

A. Questions Pertaining to the Experimental Arithmetic Program

1. When you were first introduced to the Experimental Arithmetic Program, what was your reaction?

_____It seemed like a very good idea.
_____It seemed like a fairly good idea.
_____It made no particular impression on us.
_____It seemed like an annoyance.

2. Did you or your wife/husband attend any of the meetings which were held in connection with the Experimental Arithmetic Program?

_____Yes.
_____No.

3. How often did your child bring home the packets used in the Experimental Arithmetic Program?

_____Weekly
_____Almost every week
_____Seldom
_____Never, to the best of my knowledge.

4. Did you find the materials in the packet

_____too simple?
_____about right?
_____rather difficult to follow?
_____impossible to follow?

5. To evaluate further, how would you rate the following items which came in the packets:

The teacher's specific written suggestions for your child
_____useful
_____sometimes useful
_____useless
_____didn't have enough acquaintance with this item to evaluate.

Weekly descriptions of what was being taught in arithmetic
_____useful
_____sometimes useful
_____useless
_____didn't have enough acquaintance with this item to evaluate.

Flash cards, games, and materials for practicing arithmetic skills
_____useful
_____sometimes useful
_____useless
_____didn't have enough acquaintance with this item to evaluate.

General practice arithmetic problems
_____ useful
_____ sometimes useful
_____ useless
_____ didn't have enough acquaintance with this item to evaluate.

6. How did your child "take" to the project?

_____ Eagerly
_____ Willingly, but not eagerly
_____ Obediently, but with little or no enthusiasm
_____ Reluctantly

7. Who helped your child with this project most of the time?

_____ No one
_____ Mother
_____ Father
_____ If someone else, who?

_____

8. How much time was spent on this project and how often was it done?

_____ It was an every day project.
_____ It was done almost every day of the week.
_____ It was done irregularly on different days of the week.
_____ It was seldom done.
_____ Never or practically never done.

9 If work on the project was irregularly done, or never done, could you explain why in a word or two? (For example: illness, lack of help, lack of understanding, etc.)

10. What effect did the project have on your child's attitude toward arithmetic?

_____ His attitude toward arithmetic improved.
_____ His attitude toward arithmetic was good to begin with and the project made no change in his attitude.
_____ His attitude toward arithmetic was poor to begin with and the project made no change in his attitude.
_____ The project gave him a disliking for arithmetic.

11. Did the project change your child's attitude toward school in general or toward other courses and activities?

_____ It brought about much change and improvement in his attitude.
_____ It brought about some change in his attitude.
_____ It brought about little or no change in his attitude.
_____ It changed his attitude for the worse.

12 What effect, if any, do you think this project may have had on your child's progress in his current 4th year in school?

_____ It has helped his progress.
_____ It is hard to say if it had any effect at all.
_____ It retarded his progress.

13. As a result of this project, would you say: (check any number of answers.)

_____you have a better understanding of third year arithmetic as it is now being taught?
_____you have a better understanding of what your school is trying to do?
_____you feel closer to your school in general and to your child's progress in particular?
_____you feel no closer to your school than before and your understanding is unchanged?
_____you are confused about what your school is trying to do?
_____you do not think your school is "on the right track"?

14. Do you think the Experimental Arithmetic Project should be

_____continued for all third year pupils?
_____offered to some other third year pupils?
_____not offered at all?

15. What suggestions for improvement would you make if the program was offered again? (You may check more than one.)

_____More arithmetic materials for use by the child, like flash cards, games, rulers, and milk cartons.
_____More specific written information regarding your child's work.
_____More meetings with the teacher.
_____Program at a different grade level. If so, what grade?_____
_____A fuller description of what is being taught in class.
_____More general practice problems.
If other, please list below.

16. General comments, if any, about the Experimental Arithmetic Program.

B. Questions which will provide background information for the study.

1. About how long have you lived in Flint?

_____5 years or less
_____More than 5 years

2. About how long have you lived in your present elementary school neighborhood?

_____5 years or less
_____More than 5 years

3. To what extent have either or both of you attended or participated in the following activities? (Please put an "x" in the box which gives the most suitable answer.)

	Regularly	Sometimes	Never
PTA meetings			
Child Study			
Men's or Women's Club			
Adult Education Classes			
School fairs or concerts			

4. How far did you go in school? (Please check one box for mother and one for father.)

	Mother	Father
8th grade or less		
9th grade		
10th grade		
11th grade		
12th grade, but did not graduate		
High school graduate		
College, but did not graduate		
Four-year college degree		
Graduate work in college		

5. Did you enjoy school when you attended?

	Mother	Father
Very much		
Quite well		
Tolerably		
Not much		
Not at all		

6. Would you care to indicate your age group? (Your answer is optional, of course.)

	Mother	Father
20 to 29		
30 to 39		
40 or over		

7. What is your occupation?

Mother_____ Place_____
Father_____ Place_____

8. Do you live:

_____ with relatives?
_____ in an apartment?
_____ in a rented house?
_____ in your own home?

9. In which category would you say your annual family income falls? (Your answer is optional, of course.)

_____ Under $5,000
_____ $5,000 to $9,000
_____ Over $9,000

Thank you for your cooperation.

Please return the questionnaire to your child's teacher in the enclosed envelope.

TABLE 37

T-TEST--ARITHMETIC ACHIEVEMENT

ARITHMETIC REASONING

	School A		School B		School C		School D	
	Exp.	Con.	Exp.	Con.	Exp.	Con.	Exp.	Con.
N	61	120	27	72	22	49	29	63
$\bar{X}$	4.5705	4.0183	4.3519	3.7792	5.2727	4.4265	3.6931	3.6222
S^2	.6791	1.1271	.1780	.7986	.6240	1.2616	.5607	.4982
S^2/S^2	1.66 ∤	.61	4.49 ∤	.....	2.02 ∤	.....	1.13 ∤	.....
t	.....	3.856	.....	4.306	.....	3.638	.....	.01641

ARITHMETIC COMPUTATION

N	61	120	27	72	22	49	29	63
$\bar{X}$	4.6098	3.8417	4.4037	3.6833	4.7227	4.1061	3.9793	3.6762
S^2	.1682	.4660	.1781	.4741	.3056	.7785	.4353	.1951
S^2/S^2	2.77 ∤	.36	2.66 ∤	.....	2.55 ∤	.....	2.23 ∤	.....
t	.....	9.436	.....	6.275	.....	3.574	.....	2.254

ARITHMETIC AVERAGE

N	61	120	27	72	22	49	29	63
$\bar{X}$	4.6098	3.9567	4.4074	3.7639	5.0682	4.2918	3.8690	3.6730
S^2	.3156	.6605	.1492	.5353	.4480	.9087	.4322	.2505
S^2/S^2	2.09 ∤	.....	3.59 ∤	.....	2.03 ∤	.....	1.67 ∤	.....
t	.....	6.322	.....	5.655	.....	3.937	.....	1.422

TABLE 38

T-TEST--INTELLIGENCE QUOTIENTS AND READING AVERAGES

EXPERIMENTAL GROUPS

IQ	School A	School B	School C	School D	Reading Average	School A	School B	School C	School D
ΣX	6511	2773	2215	2779	ΣX	252.3	92.1	92.0	85.9
ΣX^2	697,161	286,133	225,223	269,125	ΣX^2	1117.39	323.39	408.72	263.41
N	61	27	22	29	N	61	27	22	29
$\bar{X}$	106.7377	102.7037	100.6818	95.8275	$\bar{X}$	4.1360	3.4111	4.1818	2.9620
S^2	36.5300	51.3703	105.3701	100.7192	S^2	1.2310	.3548	1.1425	.3202

CONTROL GROUPS

ΣX	12619	6977	4684	6141	ΣX	485.0	263.2	187.8	202.2
ΣX^2	1,336,583	678,309	452,752	603,175	ΣX^2	2142.68	1042.64	778.70	674.90
N	120	72	49	63	N	120	72	49	63
$\bar{X}$	105.1583	96.9027	95.5918	97.4761	$\bar{X}$	4.0416	3.6555	3.8326	3.2095
S^2	80.588	31.2439	104.1632	73.7695	S^2	1.5333	1.1337	1.2276	.4182
S^2/S^2	2.21 ≠	1.64 =	1.01 =	1.37 =	S^2/S^2	1.25 =	3.20 ≠	1.07 =	1.31 =
t	1.401	.4248	1.935	.76501	t	.52011	1.438	1.258	1.862

TABLE 39

STANDARD DEVIATIONS--EXPERIMENTAL GROUPS

ARITHMETIC REASONING

	School A	School B	School C	School D
	M = 32 F = 29	M = 15 F = 12	M = 9 F = 13	M = 16 F = 13
ΣX	278.8	117.5	116.0	107.1
ΣX^2	1315.00	515.97	624.74	411.23
N	61	27	22	29
$\bar{X}$	4.5705	4.3519	5.2727	3.6931
S^2	.6791	.1780	.6240	.5607

ARITHMETIC COMPUTATION

ΣX	281.2	118.9	103.9	115.4
ΣX^2	1306.38	528.23	497.11	471.40
N	61	27	22	29
$\bar{X}$	4.6098	4.4037	4.7227	3.9793
S^2	.1682	.1781	.3056	.4353

ARITHMETIC AVERAGE

ΣX	281.2	119.0	111.5	112.2
ΣX^2	1315.22	528.36	574.51	446.20
N	61	27	22	29
$\bar{X}$	4.6098	4.4074	5.0682	3.8690
S^2	.3156	.1492	.4480	.4322

TABLE 40

STANDARD DEVIATIONS--CONTROL GROUPS

ARITHMETIC REASONING

	School A	School B	School C	School D
	M = 63 F = 57	M = 36 F = 36	M = 27 F = 22	M = 30 F = 33
ΣX	482.2	272.1	216.9	228.2
ΣX^2	2071.76	1085.01	1020.67	857.48
N	120	72	49	63
$\bar{X}$	4.0183	3.7792	4.4265	3.6222
S^2	1.1271	.7986	1.2616	.4982

ARITHMETIC COMPUTATION

ΣX	461.0	265.2	201.2	231.6
ΣX^2	1826.46	1010.48	863.52	863.50
N	120	72	49	63
$\bar{X}$	3.8417	3.6833	4.1061	3.6762
S^2	.4660	.4741	.7785	.1951

ARITHMETIC AVERAGE

ΣX	474.8	271.0	210.3	231.4
ΣX^2	1957.22	1058.02	946.19	865.96
N	120	72	49	63
$\bar{X}$	3.9567	3.7639	4.2918	3.6730
S^2	.6605	.5353	.9087	.2585

TABLE 41

T-TEST--ARITHMETIC ACHIEVEMENT, ALL SCHOOLS

EXPERIMENTAL GROUPS

	Arithmetic Reasoning	Arithmetic Computation	Arithmetic Average
	619.4	619.4	623.9
	2866.94	2803.12	2864.29
	139	139	139
	4.4561	4.4561	4.4885
	.7741	.3116	.4632

CONTROL GROUPS

	1199.4	1159.0	1187.5
	5034.92	4563.96	4827.39
	304	304	304
	3.9454	3.8125	3.9063
	.9994	.4794	.6228
	1.29	1.54	1.34
	5.433	. . . . .	7.975

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