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AUTHOR	Wohlferd, Gerald H.
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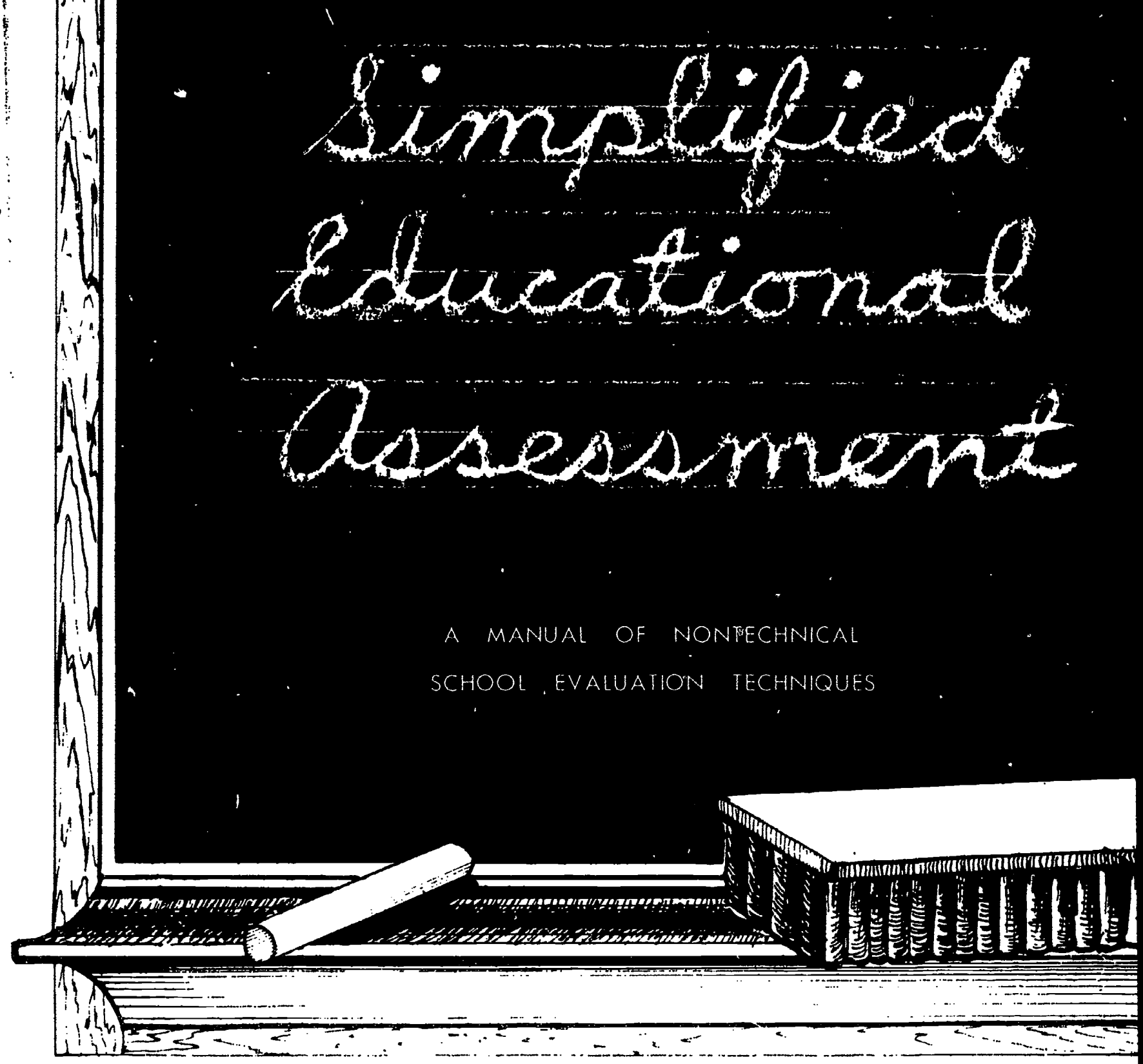
ABSTRACT

Assessment of an educational system can be done without using elaborate statistical techniques. Some very simple ways of analyzing data and presenting information are quite useful. This manual is presented for use by those school personnel who feel a desire to assess the quality of their educational system, but who would welcome suggestions as to how the assessment might be done. It is designed to fill the gap between no analysis and refined statistical analysis. The illustrated analytical methods presented herein are elementary, and basic data needs are readily satisfied. (Author/DEP)

Simplified Educational Assessment

A MANUAL OF NONTECHNICAL
SCHOOL EVALUATION TECHNIQUES



The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Bureau of School Programs Evaluation
Albany, New York 12234
October 1974

SIMPLIFIED EDUCATIONAL ASSESSMENT

A Manual of Nontechnical
School Evaluation Techniques

The University of the State of New York
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FOREWORD

Evaluation is an idea whose time has arrived. School systems can and are presenting the public with much information on how pupils are faring in various cognitive areas. This pamphlet offers some excellent common sense approaches to evaluation which all too often are neglected.

Assessment of an educational system can be done without using elaborate statistical techniques. Some very simple ways of analyzing data and presenting information are quite useful. In fact the layman can better understand statistics presented in chart form than those couched in statistical jargon.

This manual springs from concerns expressed by school personnel to Gerald H. Wohlford, its author, and to Charles M. Armstrong, now retired. Accordingly, the manual is presented for the use of those school personnel who feel a desire to assess the quality of their educational system, but who would welcome suggestions as to how the assessment might be done. It is designed to fill the gap between no analysis and refined statistical analysis. The illustrated analytical methods presented herein are elementary, and basic data needs are readily satisfied. Those interested in using any of the procedures outlined in the text may contact the Bureau of School Programs Evaluation for needed help.

John W. Polley
Associate Commissioner for
Research, Planning and
Evaluation

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SIMPLIFIED EDUCATIONAL ASSESSMENT

Introduction

How good is my school? This question, which at first glance appears to be sensible and straightforward, is in fact very difficult to answer. No single answer can be given since many courses of study, grade levels, rooms and diverse individuals compose a school. The question, then, is really a series of questions whose answers, when taken together, give an indication of the quality of education being provided. Some of the questions whose answer might better be sought are: How do the children in my school compare with other children in the nation, the state, among themselves? How have the children progressed over the years? Are the teachers equally effective in teaching?

Some of the above questions are being answered every day. Others are avoided because of clerical costs involved in collecting and preparing data for analysis, or because of ignorance of statistics. Fortunately, simple analyses are not costly, nor is a comprehensive knowledge of statistics necessary. Too, most of the data, necessary to a simple analysis, are already on hand or are easily obtained. Often all that is needed is a reordering, classifying, or sorting of available data.

Asking the Right Question

However, before educational data analysis is started a few helpful hints might be in order. The first is to ask only those questions which can be answered. For example, the question, "How do the children in my school compare with other children in the nation?," is quickly recognized

as being too broad. In its present form it can not be answered. One would want to specify at least as to subject area and grade level. The question would better be phrased, "How do the third grade children in my school compare in reading skills with other children in the nation?" If desired, further specifications can be made, so that the subject area is delineated by the particular reading skill involved, and the type of student is identified. The original question would thus be supplanted by multiple questions, such as: "How do the third grade boys in my school compare in reading comprehension skills with other third grade boys in the nation?" and, "How do the third grade boys in my school compare in reading vocabulary skills with other third grade boys across the nation?", etc.

Another hint in making school evaluations is to ask questions which are of value--questions which are usable as a basis for management and curriculum decisions. For example, to ask how many kindergarten students can multiply fractions would be a waste of time. One might better ask about the reading vocabulary skills of boys and girls in order to decide whether more emphasis should be placed upon skill building in that subject area in planning subsequent curriculum activities.

One must expect that answers to evaluation questions may reveal shortcomings as well strengths. The strengths may then be capitalized upon, while the shortcomings may be used as points of discussion of future administrative policy, curricula, organization, or program changes.

A third hint is that evaluation is like quicksand in that the answer to one question leads to asking further questions and into even deeper data analyses. Sooner or later a point is reached where a district

must decide that it has gone far enough. Therefore, it might be wise to set up a tentative evaluation program at the start, which establishes the limits to the evaluation.

Accuracy of Data

A caution about the accuracy of data is in order. No single piece of datum should be accepted as an accurate measure until it is at least checked for sensibleness, and possibly duplicated at another time. Thus, a single I.Q. measure on a child must only be considered accurate within a range of fifteen points on either side of the obtained score. A second score which is about the same would lend some assurance that both scores are probably right.

In the same vein, be increasingly more suspicious of data as it passes through several people before being used in any analysis. Each time figures are transferred from one source to another the chance of error is increased. No one is infallible. Most of us have dialed a wrong telephone number at some time. Nor is human error the sole source of poor data. Computers do make errors. Usually they produce such whoppers that the errors are quickly seen. But dirty equipment, old or cheap tapes, brittle cards, or temperature variations, can produce difficult-to-discover errors. Therefore, be suspicious of your data, whether it is hand copied or computer compiled, and cautious in making judgments from it.

Finally, an answer to a question needs to be supported by subsequent analysis before drastic changes are made in school policy or program. One research finding is a hint; the second similar finding is a suggestion; the third is probable proof or establishes a trend.

Comparison to National Norms

The following sections will show how various educational questions can be answered without recourse to detailed statistical analyses or expensive data handling. Most school districts conduct an achievement testing program on a yearly schedule. The purpose of such a testing program can be twofold. First, the tests may have pupil diagnostic capabilities. The question answered in this situation is "On what specific knowledge segments do individual children require remedial or catch-up help?" Since the question answered is not, in this form, a school evaluation question, it will not be discussed further at this time. Second, the test results are usually stated either in terms of averages or percentiles. The question answered in this situation is, "How do my children (by grades in which tests are given) compare in achievement (by subject and subtests available) with other children in the nation?"

Comparison Over Time

The latter analysis, i.e., a comparison to national norms, is known as a status analysis, because only one point in time is considered. As a status analysis, it has limited value since children in the school district seldom match the national sample on which the test norm tables are based. The real value is in comparison of district scores over time. As long as the test battery remains the same, and the norm tables which are matched to it remain the same, the test norms provide a stable scale against which to compare one year's achievement with scores of preceding years. District averages reported as grade equivalents or percentiles may be plotted on a chart such as Figure 1. More than one test area, such as related subtest

scores, may be recorded at the same time. Many simultaneous plottings may, however, lead to confusion rather than clarity.

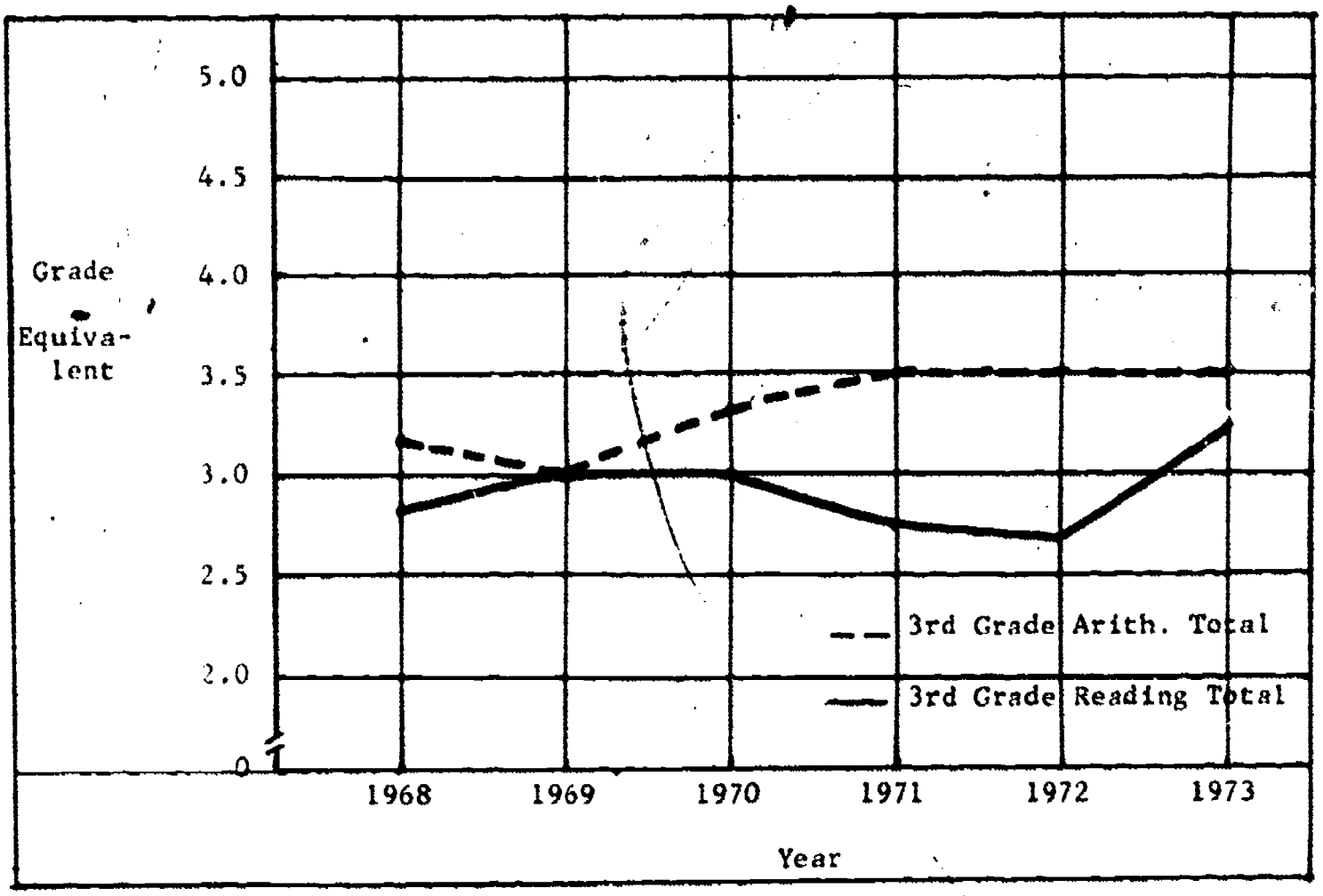


Figure 1. Third Grade Achievement Over Time

Figure 1 would indicate to the district (hypothetical) for which third grade reading and arithmetic grade equivalent scores were plotted, that their students are achieving near the national average (3.0) as established by the test company. Between 1969 and 1971 arithmetic averages had an upward trend. Subsequently they leveled off. Reading slumped for a number

of years and then spurted upward. The administrator would want to look for reasons why the grade equivalents had changed. Were the gains in arithmetic and losses in reading due to a change of scheduling in 1969 which assigned fifteen minutes of daily second grade reading time to arithmetic? Could the gain be attributed to a successful Title I compensatory education program? Was the gain in reading possibly due to a new reading curriculum established in 1972? If the latter, was it because the children actually read better, or was the curriculum now oriented toward teaching items or skills tested in the reading test? Will the gain in reading scores be maintained?

These and other questions will have to be answered through further study and experimentation. The change of arithmetic scores may not have been due to a scheduling change. Experimentation with an altered schedule in a school building, or in a single room if the district is small, could possibly give an answer to why the arithmetic and reading scores changed. Only time would tell if the last year's reading gain would be maintained. However, study of test items in comparison with both old and new curricular materials may give a tentative reason for the sudden rise in reading scores even before next year's test results are secured.

As can be seen from the above discussion, the use of simple statistical methods can lead to more questions. When a change in score occurs, the obvious response is to ask, "Why did the scores change?" A sensible reason for the change should be searched for. Not always are changes due to school-controlled situations. The real reason for the change in reading

scores in the illustration above could have been something external from the school, such as the starting of a summer reading program at the local library, an influx of able students from a local private or parochial school which closed, or the cumulative effect of a TV program such as Sesame Street. Thus, the school administrator should look to areas both under and outside the control of the school for possible causes of change of achievement scores.

Subclassification

One method of searching for out-of-school causes is to divide the children into various subgroups and compare the achievement averages of the groups. One common division is by length of time in attendance in the school district. New entrants can depress or raise achievement averages. New homes can add a different type of student depending upon the cost of the housing. The question then evolves to, "What type of student is causing the scores to change?" Or, "Do different student subgroups achieve at differing levels?"

Should subgroups be found to achieve at different levels, special programs can be designed to help alleviate those with depressed scores. For example, a district which covers a wide range of community types may wish to group the records of the children by community type, such as urban central, suburban, and rural fringe. Should the early elementary rural fringe students have lower reading scores, a search might be made for storybooks more closely related to rural living. Should the urban central students show retarded learning skills, the administration may wish to place more emphasis upon parental participation on PTA and other school affairs.

Attention directed to the educational and social needs of specific subgroups will, if successful, have the effect of raising the total group average. The above discussion points out that total group averages can hide the differing academic levels of subgroups.

New York State, because of its mandated statewide testing, is one of the few states in which districts can answer the question, "How do the children in my school district compare with other children in the state?" Of course, the question has to be rephrased so it is more specific as to curricular area and grade level. The state "Pupil Evaluation Program, School Administrators Manual" August, 1974, offers many valuable suggestions for analyzing the data provided in the yearly report that help answer the above question. One addition to their suggestions could be made. On page 15 a chart is shown which compares over a number of years for two school buildings the percent of students achieving below the Statewide reference point. A school district can change the chart by omitting one school building, instead substituting the percent of students in the average category, and the percent of students in the above average category for the remaining school (see page 11 of PEP School Administrators Manual for method of securing percents).

Figure 2 illustrates how percents for students grouped by ability may be plotted together. It shows what can happen when attention is focused upon a particular group of students. In 1968 and 1969 the district was operating so that each group of students was achieving at about the same level in the subject tested. The district then became concerned with the increase in the percent of students in the "below average" category. Teachers were urged to place greater emphasis upon reducing the percent of students in that category. The program was successful in 1971 and 1972.

However, there was a simultaneous drop in the percent of students from the "above average" group. The trend continued in 1972. Thereafter, greater attention was given to the loss of students from the "above average" group. Subsequently, the percent of pupils in the "above average" group rose. However, so did the percent of students in the "below average" group.

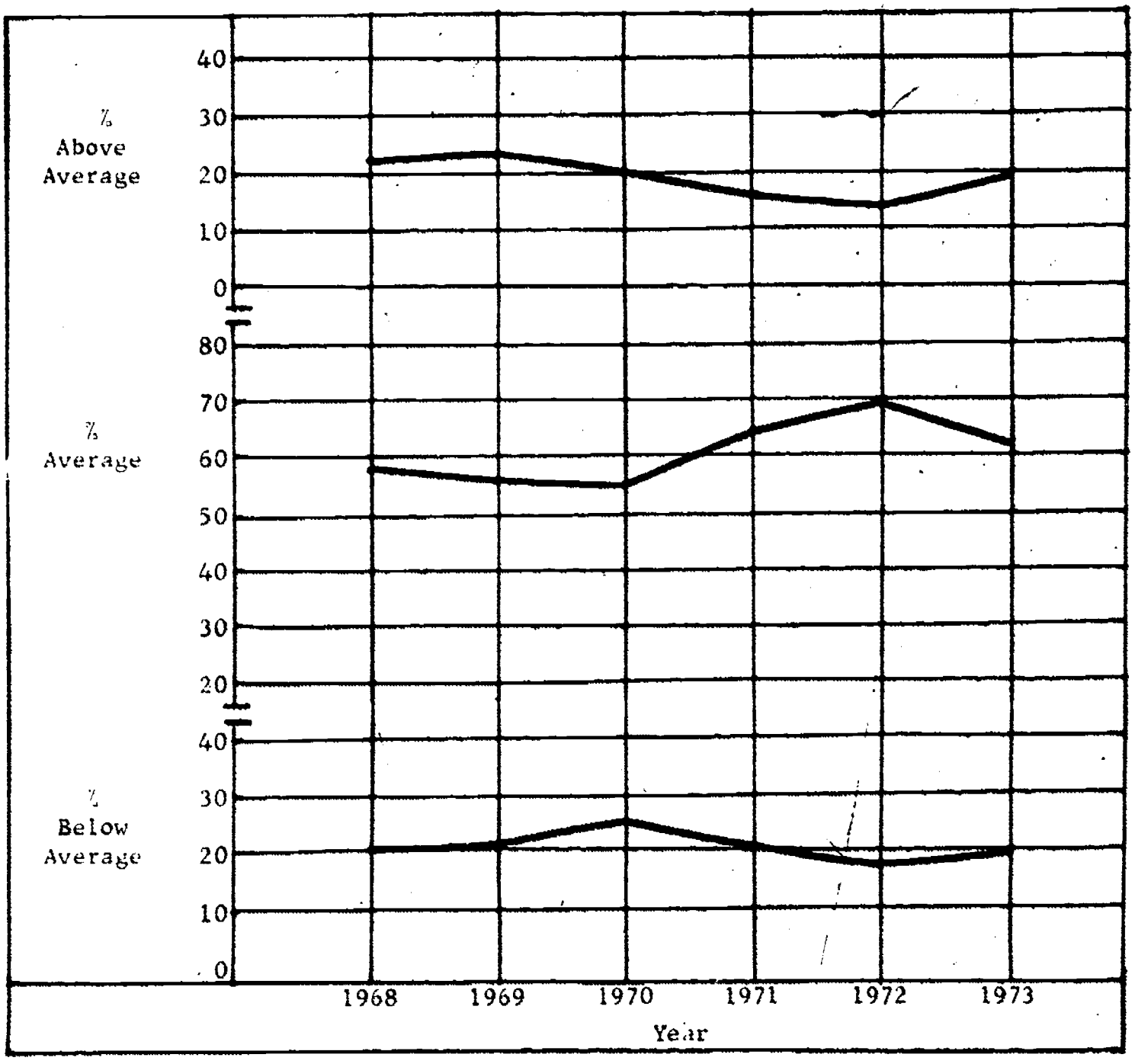


Figure 2. Percent of Total Reading Scores Over Years

The above analysis illustrates the need of asking an important question whenever a change of policy or program has been placed into operation. It is, "What are the results, positive or negative, which occur other than those expected?" Attention solely to the "below average" category would have missed the effect upon the "above average" group, unless proper data analysis was conducted.

Standard Deviation

Commercial test companies also report scores in terms of standard deviations. A standard deviation is a calculation of the general spread of scores. It shows how closely the scores are grouped around the average (or mean). About 68 percent of the scores fall within the range of one standard deviation above the mean to one standard deviation below the mean. The standard deviation changes as the spread of student scores changes, becoming greater as the spread of scores increases and becoming less when scores group more closely to the mean. Thus, comparison of standard deviations over the years, roughly answers the question, "Are the students in a grade in succeeding years retaining the same closeness or spread of scores?" This question may be crucial when a new program or theory of learning is tried. For example, Figure 3 illustrates how the standard deviations can be added to and subtracted from the averages and then plotted. The increase in the spread of scores starting in 1969 might be the result of greater emphasis on allowing each child to progress at his own speed.

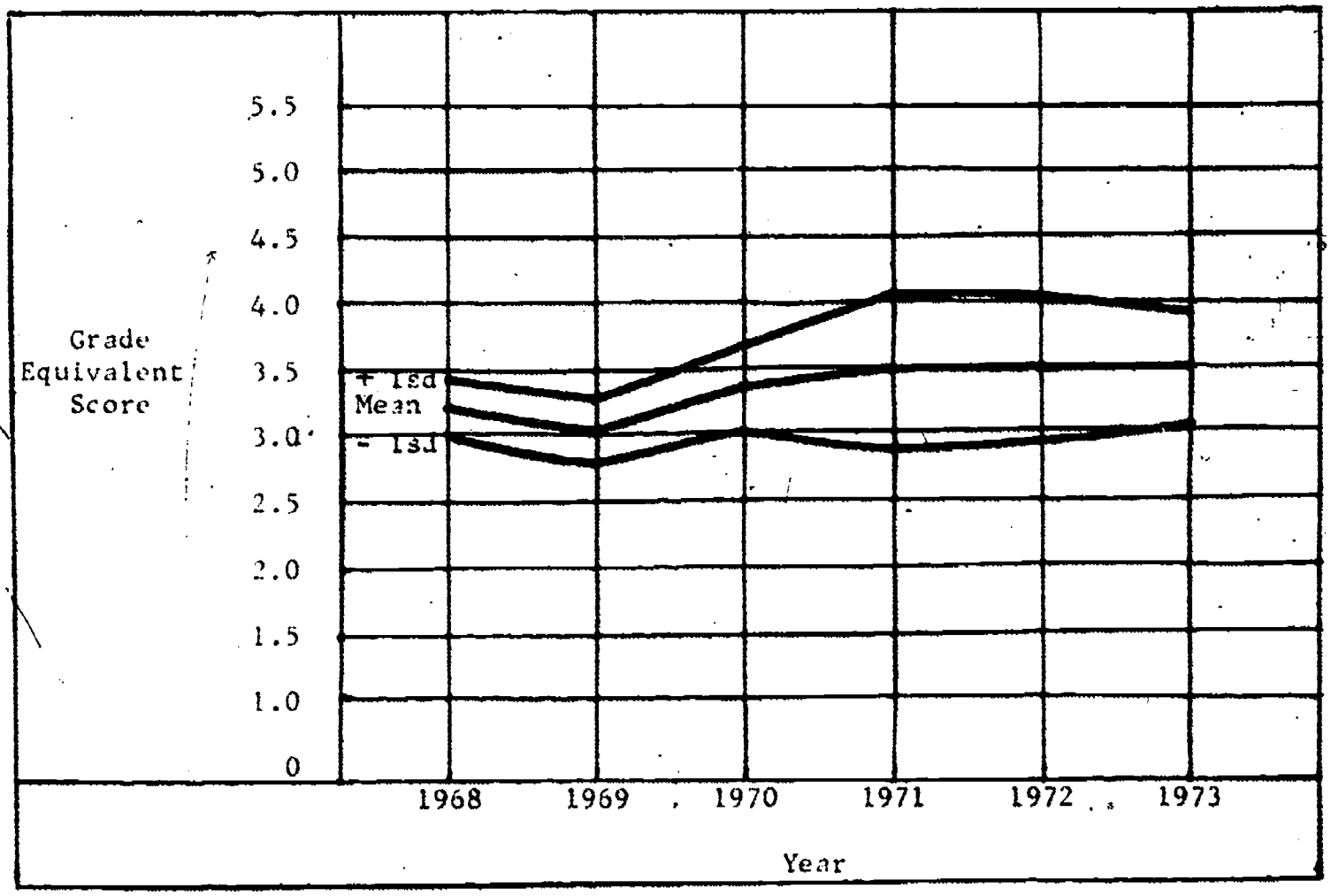


Figure 3. Spread of Scores Around Average Over Time

The reduction in spread of scores between 1972 and 1973 could have resulted from a policy to give special help to the slower students. Bringing their scores closer to the average would have the effect of reducing the standard deviation.

Distributions of Scores

As illustrated in some of the text, the question, "How are my children achieving?" can sometimes be better answered if subgroups are used

to form new averages for comparison. Subgroups were chosen in those illustrations on the basis of theory or experience. Some natural subclassifications come readily to mind. Sex, age, achievement level, home background, and type of community surroundings are but a few that can be used. There are times when the usual classification schemes do not yield insights into how adequately students are achieving and why. Since all programs are not equally successful for all pupils, the question might then be asked, "Which students are benefiting greatly from school and which students might be affected adversely?" The reason for asking this question springs from the theory that a good school is one that constantly tries to make it easier for its children to learn. Those program aspects which are effective can be incorporated into other learning situations. Those ineffectual should be discontinued.

Frequency Distributions

Often, identification of helpful or harmful aspects are hard to discover using the preceding data analysis methods. A rewarding method of looking at pupil scores is to chart them as distributions. Distributions of student scores which can reveal differing effects to be taking place, are constructed from listings of student scores, as in Table 1. From the list of student scores, the number of scores by group is determined. A chart of the number (frequency) of students for each score is then constructed. Figure 4 is an example of a frequency diagram (in this case it is a line graph) constructed from the listing of scores in Table 1.

Table 1

List of Student Scores and Numbers in Groups

Score	Number of Students	Number in Group
25	1	
26	1	6
27	2	
29	2	
30	1	
31	2	
32	2	
33	2	12
34	1	
35	1	
36	2	
37	1	
41	1	
44	1	
45	1	8
47	1	
48	2	
49	2	
51	2	
53	3	
54	1	11
56	2	
57	1	
58	2	
60	3	
61	1	
63	1	
64	2	15
65	1	
66	1	
67	3	
68	1	
69	2	
70	2	
71	1	
72	3	
73	4	19
74	2	
75	1	
77	4	
78	1	
79	1	
80	3	
81	2	
82	1	
83	1	13
84	2	
86	2	
87	1	
89	1	
91	1	
94	1	4
95	1	
98	1	

The frequency of scores should ideally assume the rough shape of a bell. Gross irregularities from a bell shape is an indication that some force may be in operation which causes scores to move to new values.

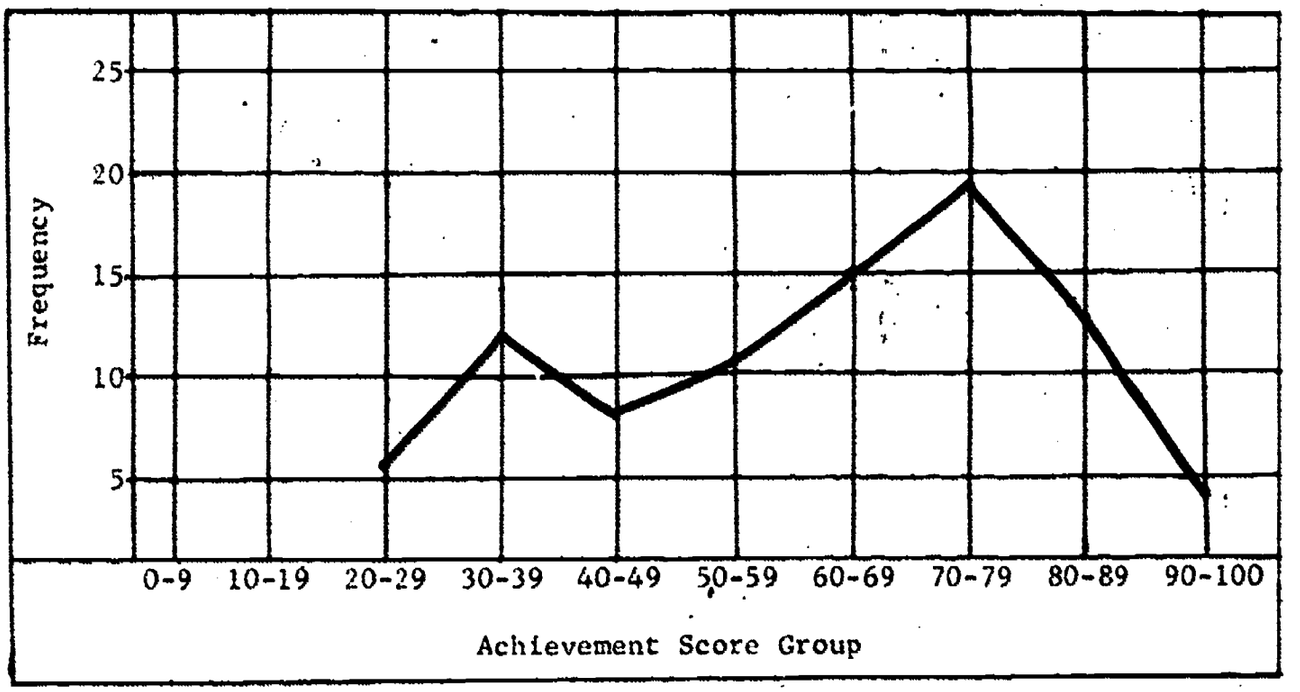


Figure 4. Frequency Distribution of Achievement Scores

The distribution of scores in Figure 4 is biomodal, that is, there are two humps. Special attention should obviously be focused upon the children who compose the lower hump, and reasons for their low grouping should be investigated. In this example the test scores could have represented a situation where three classrooms were combined for an audiovisual presen-

tation of the course content. The students met in the cafeteria at one end of which a television set was placed. When students in the lower (mode) were identified by name and ability, there did not at first seem to be any sensible reason for their low scores. A teacher in charge of the combined class finally saw a pattern. A large proportion of the lower mode was composed of students who sat in the back of the room. It was then quickly determined that these children were too far from the television set for adequate viewing. Also, noise coming from the kitchen made hearing difficult. Furthermore, upon further analysis of scores in the lower hump it was found that a few pupils were negatively affected because the surroundings were quite dissimilar from the traditional classroom setting. However, due to the general success of the audiovisual presentation, a decision was made to purchase more television sets, and to move the children back into their three regular classrooms where the T.V. programs could be seen and heard by all children.

The foregoing discussion has pointed out how distributions of student scores can be used to determine probable causes of poor education. Questions which might be answered are: "Are the educational programs of the school equally effective for all children?", "If not, which children are being adversely affected?", "Why were these children adversely affected?", and "What changes can be made in order that adverse affects can be removed?"

Scattergrams

Several ways of searching for answers to the question, "How good is my school?", have been presented. Previous discussions have used the

average as a basis of comparison, even though children of different abilities compose the group for whom the average has been found. Though the previous analytical techniques can offer means of gaining insights into school quality, a most important question has been omitted. It is, "Are the children progressing at a proper speed?" Fundamental to this question is the theory that a good school is also a school in which children are recognized as having different learning speeds, and are helped to proceed through the various school levels at their own unique rate. Central to any assessment of school quality under such a theory of education is the determination of the correct speed at which each child should progress.

Scattergrams offer a convenient method of determining the adequacy of speed of pupil progress. They are constructed by plotting on a graph the juncture of two measures or scores for each pupil. The pattern of the plotted scores yields information about the progress of the group, and the location of individual plotted points reveals the adequacy of progress of specific students. Two types of scattergram plots can be done. The first, based upon the theory that mental age is a good predictor of pupil progress, plots mental age against academic achievement. The second, based upon the theory that past achievement is one of the best indicators of present and future achievement, plots past achievement levels against present achievement. Both of these theories have been shown in past research to be true as far as educational progress is concerned, but are not necessarily true for prediction of post-graduation job success. In the former situation, understanding of the scattergram is aided if mental age is converted into a mental grade score which is comparable in scale to an achievement grade equivalent score. A table for conversion of

mental age scores to mental grade scores is provided in Appendix A.

Figure 5 shows a completed plotting of student's grade 5 reading comprehension scores with their mental grade scores. Each student's mental grade and grade equivalent scores are plotted on the scattergram at the junction of their values. Each student may be entered as a tally, however, in Figure 5 the tallies have been totaled here for ease of viewing. Student A could be one of the six children having a mental grade score of 8 and an achievement age score of 8, while student B could be the one student with a mental grade score of 9 and an achievement age of 12.

A diagonal line composed of dashes has been drawn through the squares which have equal values on both scales. This is an expectancy line since children would theoretically be expected to score on achievement tests at a level comparable to their mental age. Because no test is a completely accurate instrument, the scores cannot be expected to fall exactly along the line of expectancy. Errors of measurement would expand the expectancy band to at least one grade level above and one grade level below the dashed line. This band, within which scores might normally be expected to fall, is outlined by two light solid lines, one above and one below the dashed line. Tallies found in squares which are cut by, or between, the solid lines are to be considered as within expected ranges. Tallies of children found above the top solid line suggest the children to be achieving in academic skills above that which can be expected in light of their mental ages. Those tallies below the lower solid line indicate the children are achieving in academic skills at a level lower than could be expected in relation to their mental ages.

Figure 5 shows many pupils to be achieving below what could be expected. Whether the pattern shows achievement levels to be unexpectedly high or low, explanations should be sought. First, possible causes outside the school should be explored. Such things as changes in the population of the community or activities at the public library could produce changes in student scores. Failure to account for such factors could lead to erroneous conclusions about the effects of school programs.

Achievement Grade	Mental Grade Score											
	1	2	3	4	5	6	7	8	9	10	11	Total
13												
12								1	1			2
11												
10								1				2
9								3	2	1		6
8						2	2	6	2	2	1	15
7				2	3	1		3	2	2		13
6				1	4	2	2	5		2		16
5				3	3	6	6	5				21
4		1	2	5	8	5	2	2				25
3		3	4	2	3	1						13
2		2	1	3	1							7
1		2										2
Total		8	7	16	22	15	12	26	7	7	2	122

Figure 5. Scattergram of Mental Grade Scores and Achievement Grade for Grade 5 Reading Comprehension

A second source of possible explanations includes the characteristics of the tests and analytical procedures. If the tests do not well represent the curriculum, if there were irregularities in testing procedures, or if test results are compiled so as to obscure relationships, the results may be irrelevant or biased.

Finally, factors in the school environment should be scrutinized to identify possible explanations for the performance of students. This is the ultimate question, for it is the school environment which can be changed to improve student achievement.

The second type of scattergram plots one year's achievement against that of a subsequent year. As mentioned before, the theory behind this type of evaluation is that previous achievement is related to later achievement. Of course, schools try to increase the achievement level of their charges until they reach their maximum. At the same time, care is taken not to push the students to the point of frustration.

Paradoxically, a tally appearing above or below the expected line can be due to either an unusually good score on one axis, or an unusually poor score on the other axis. It is the duty of the analyst to determine if either of the above situations exists, or if in fact the scores are true and valid measures of that student's ability or accomplishment.

Figure 6 illustrates the plotting of reading scores of third grade children against the reading scores of the same children in grade four. Once again a diagonal dashed line has been drawn to pass through the juncture of expected scores. The solid lines outline the area of probable progress.

Subject Reading School X

UPPER GRADE 4	LOWER GRADE 3 1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	Total
8.8											
8.0											
7.2								1			1
6.4				1		1	1	1			4
5.6			3	2	3	2	2	1			13
4.8		2	2	3	1						8
4.0	1	2	1	1							5
3.2		1									1
2.4											
1.6											
Total	1	5	6	7	4	3	3	3	3		32

Grade Equivalent Scattergram

Figure 6. Scattergram of Third Grade Achievement Plotted Against Fourth Grade Achievement.

The pattern of scores shown by the entries on Figure 6 suggest that the fourth grade teacher (if they were year-end tests) placed much emphasis upon raising the scores of low achievers. This is revealed by the greater number of children appearing above the lower end of the diagonal line. Unfortunately, the better achievers may have suffered from a lack of attention as shown by the appearance of scores below the line at the upper end. Possibly too, the unusual shape could have been due to a change of instructional materials that did not adequately challenge the more able students.

The cluster of students above the middle of the line should also cause a search for reasons. Maybe, these students lived in an area where one of the park supervisors had spent the summer evenings reading stories to area children and listening to them read. Or, possibly the children, who showed advancement above that expected of them, were involved in an experimental reading project.

Several types of blank scattergrams and a table of scales to be used on the margins of grade equivalent scattergrams are provided in Appendix B. Percentiles, a common method of reporting pupil scores in high school, may also be plotted on a scattergram. A blank percentile scattergram is provided for duplication in Appendix B.

Modes and Clusters

An added value of scattergrams is that they reveal groupings (modes), the spread of scores, and how closely the scores group together. The total columns at the side and bottom are similar to that of a line graph. Modes, then, can be seen not only through the numbers on the margins but also in

the clustering of scores in the body of the tables. In the body of the scattergram the greater number of the tallies should cluster closely to the dashed line. Groups of students' scores that suggest some forces at work may be positive (those above the major grouping) or negative (those below). In Figure 5, page 18, mental grade columns 7, 8, and 10 all have distinct clusters below the line. The column for mental grade 4 has a mode above the line. Two students are distinctly superior in achievement for achievement age 12. Why are the scores of these students located where they are? Are the mental ages improperly measured for any of the mavericks? Are the 10 students in mental grade column 8, rows 5 and 6, similar in some way? Are they also similar to the six and five students in columns 7 and 6? Are some of the eight students in column 5 also like the other groups of below achievers just discussed.

All of these children should be identified by name. Then similarities among them could be searched out. The children in lower modes might have been those seated in the back of the cafeteria in the illustration given earlier, they might have missed school because of a flu epidemic, or their classroom seats may be near a poorly adjusted child. Too, any sag at the top of the distribution should immediately warn the observer that the test used may not have enough questions which cover advanced curricular materials. Such a test has a low ceiling and able students "top out" the test. A flat bottom at the lower end of the distribution may suggest a false bottom to the test. In the latter situation, correctly answering only one question can yield a score well above the actual ability level of the child.

Scattergrams, as can be seen, have many uses. They can describe status at some point in time (Figure 5) or progress over a period of time (Figure 6). They are easy to construct, allow observation of two factors at the same time, while pointing to trouble and/or strong clusters and modes of students which deserve analytic attention. Through the use of color coded tallies, different groups of students may be followed in order to determine experimental, program, and/or administrative effects. Effort taken to construct scattergrams is minor in relation to their value.

Tree Diagram

The question, "How good is my school?", can also be answered through use of the tree diagram. The procedure involves following the progress of groups of students through school, determining their success at several points. The process may be done historically, that is, using past records to determine adequacy of present achievement, or it can be done concurrently to determine progressive changes.

The basic assumption behind tree diagrams is that a good school is one which keeps its children achieving as well as they have ever done, if not better. Accordingly, a child, who has done above average scholastic work in the elementary school, should continue to do good work in junior and senior high. The measure of quality is the percent of students who continue to do at least the same level work throughout their school life, as opposed to those who do not. Districts having high turnover will find this analytic method of limited use, as will those districts with poor record fil[illegible].

The tree diagrams are constructed by first dividing the long-term students into three groups according to their scores. Starting with the elementary students, their achievement is judged to have been "Above Average," "Average," or "Below Average." Table 2 is provided to help the analyst determine the rating of single scores.

Table 2

Rating Scales

Rating	Commercial Test Scores		Teacher Grades		
	Percentile	Difference from Average Grade Equivalent	Percentage	Letters	
Above Average	85-99	Two grades above average and up	85-100	A,B	E,G
Average	40-84	Average up to 2 grades above	75-84	C	S
Below Average	1-39	Up to average	1-74	D,E,F	U

Those students whose individual ratings were better than average throughout the elementary years would be assigned an "Above Average" rating. More than two scores or grades below average is cause for a "Below Average" rating. Students remaining, those who earned average grades, are assigned an "Average" rating. The number of "Above Average," "Average," or "Below Average" students is then noted on the tree. Percentages of the three groups are then computed and entered on the tree diagram (Figure 7). The reader will note that the tree lies on its side.

Junior high achievement for students in each of the three elementary groups--Above Average, Average, Below Average--is judged in the same manner and entered with percentages on the tree diagram (see Figure 7). Hopefully, all students judged to be "Above Average" students in the elementary grades will receive the same rating in the junior high school years. Experience has shown such is seldom the case, though "Above Average" elementary students are rarely judged to be Below Average" in junior high. "Average" students can and do go to both "Above Average" and "Below Average" ratings with the bulk staying "Average." Unfortunately, many "Below Average" students have been found to remain "Below Average."

Each student in the nine junior high groups are then rated according to their senior high grades or scores. Totals are found for each of the 27 groups. Totals may be entered on the tree diagram and percentages secured for each as shown on Figure 7.

As can be readily seen, the tree diagram helps one follow the progress of a particular group of students. Of the 32 children judged to be "Above Average" in the elementary school, 28 continued with that ranking in the junior high school. However, four dropped to lower rankings in the junior high years. Of the two students who dropped from "Above Average" in the elementary grade to a "Below Average" ranking in the junior high, one stayed in the "Below Average" category in the senior high, while one recovered his "Above Average" status.

Many of the "Average" rated elementary children were induced to greater achievement in the junior high and likewise into the senior high school (see Figure 7). That nine of the "Average" group finally ended as

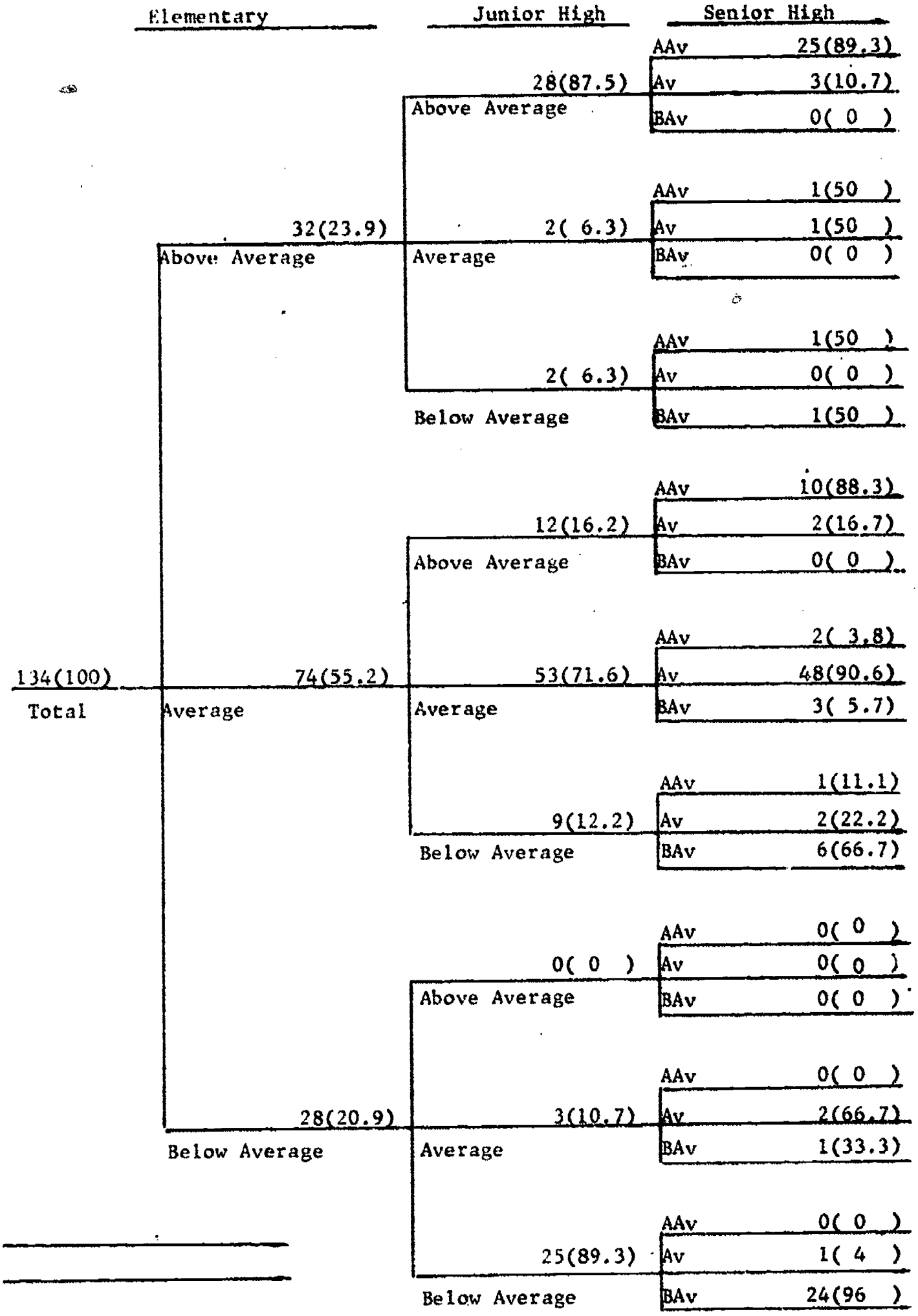


Figure 7. Tree Diagram

"Below Average" should be cause for concern. Of the 28 "Below Average" achieving students, 24 remained in that grouping throughout school. Three of the 28 students who were "Below Average" in the elementary years ended as "Average" students in their high school years.

Because of the gross method of separating the pupils when using the tree diagram method, some children who are on the borders of the groups can be expected to switch from one group to another. That does not mean that changes should be disregarded. Each drop should be cause for concern and a key to where to start looking for reasons why the drop occurred.

One of the questions answered by tree diagram analysis is, "How well have the children progressed in school?" This same question can be answered by totaling the number of children found in each of the three rated categories for elementary, junior, and senior high levels. Table 3 has been constructed from the numbers of students shown in Figure 7.

Table 3

Totaling of Tree Diagram

Rating	Elementary		Junior High		Senior High	
	N	%	N	%	N	%
Above Average	32	23.9	40	29.9	40	29.9
Average	74	55.2	58	43.3	59	44.0
Below Average	28	20.9	36	26.9	35	26.1
Totals	134	100	134	100.1	134	100

Comparison of the percentage figures among the various levels shows that this school district was able to increase the number of students in the "Above Average" category, but unfortunately found the percent of students in the "Below Average" category to increase, also. The greatest change in numbers, and therefore percents, occurred between the elementary and junior high levels. Though this large change could have been due to score shifts of those pupils near the boundaries of the categories, it could be due to other reasons as well. Different teacher grading policies, dissimilar tests used in the two levels, poor curricular coordination, and/or overcrowding could have been a few of the reasons. In any event the illustrative data tends to answer the question with a statement that the "Average" student is not progressing as well as one could wish.

Tree diagrams can be constructed similar to Figure 7 using teacher grades or commercial achievement tests. The choice of measure would depend upon completeness of data, or trust one has in the accuracy of the measure. However, enough data is usually available in a district's files to allow analysis by tree diagraming using one type.

Blank data collection charts, and blank summary tables and cards can be found in Appendix B and may be reproduced. They may be used in those situations where data and information are recorded on several source documents. The data card is especially helpful in pulling several pieces of information together on a single source. Further, the cards lend themselves to quick sorting into the three categories illustrated in Figure 7. Sorting can also be done by electronic data processing equipment.

Tree diagrams can also be used to answer questions dealing with sub-classifieations of students. For example, tree diagrams can be used to study effects of integration upon the achievement of black or white students. In this situation a historical study could first be made of the progress of both categories of students previous to integration. Measures could be drawn from school records of first, third and sixth grade teacher grades or commercial achievement tests. After integration the same type of data, recorded at similar grade levels, can be placed upon tree diagrams. Up to seven years could pass before the analysis of the effect of integration upon the scores of elementary school pupils could be completed, though interim analyses could be made along the way. Judgment of the effect of integration would depend upon comparison of pre-integration and post-integration percentage figures at each of the three grade levels. A positive effect of integration would be shown by a decrease in the number and percent of pupils in "Below Average" categories and an increase in "Average" and "Above Average" categories.

Analyses can also be done using sex, I.Q., parental education, parental occupation, or other classifications. To do so, separate tree diagrams are made for each division of the classification and comparison is made as illustrated for the integration study. Space is provided on the forms in Appendix B for classifications other than those mentioned.

Concurrent tree diagram analysis is accomplished by filling in the branches of the tree whenever data becomes available. The question changes from, "How have the children progressed?" to "How are the children progressing?" This type of evaluation is helpful in following children who

have participated in special programs. Their progress can be compared with those not included. Three years is the sensible limit for tree diagram analysis. Above three years, the data must be grouped and averaged by a larger segment of time, as in Figure 7.

Modules

For the most part the types of analyses given in the previous portions of this document are generally useful to those districts having their students in traditional graded organizations. Indeed, one of the advantages of the graded system is the tried and true measurement methods and analytical techniques available as aids to teachers and administrators. However, such is not the situation for districts using individualized instructional methods. One of the sharpest criticisms leveled at schools, which are organized so that students may advance at their own rate, is that they cannot answer the question, "How are the children progressing?" Involved in this question is consideration of proper speed of progress.

The traditional graded system of organization bases evaluation upon the progress of the group. A graded group is usually composed of children of the same age. Children are scored according to their position relative to the group. A fast learner is rated as A, excellent, or 90, while the slower child, even though he works hard, earns D, poor, unsatisfactory, or 65. Under this management system some children will always be "Above Average" and some will always be "Below Average." Obviously, an evaluation system is needed which adequately considers the unique ability of the child, when assignments are passed out and marks are given.

Expression of pupil progress in terms of modules, or units of curriculum, offers evaluation possibilities for schools organized on the individualized instruction system, whereas, scattergrams and tree diagrams offer evaluation methods for schools organized on the graded system.

Monitoring Pupil Progress

Modules are single units of study in a curricular sequence. If children are allowed to progress at their own rate in harmony with their own potential, individuals in any group of children will be working on many different modules. The logistics of merely keeping track of the progress of children becomes difficult. A simple and sensible solution is to divide the curriculum into short segments--modules--and then to construct a chart which has modules sequenced across the top and children's names listed down the side. Then, each time a child completes a module a check mark can be entered under the correct module for that child. Table 4 shows how this might be done for a single age or grade grouping. It could represent a classroom after two months of the school year have passed. Students 4 and 10 are slow learners, having fallen behind the main body of their fellows. Some are faster learners (number 7, 19 and 25) having pulled ahead.

Estimating Pupil Progress

Though Table 4 gives the teacher and administrator a satisfactory report of individual pupil status, it does not show whether the pupil's position is good or poor. Some estimate of the potential of each pupil is necessary. The simplest individual estimate can be made from a child's mental age or I.Q. Of course, each estimate should be modified by teacher judgment and/or

Table 4: Module Mastery Table

Grade _____ Subject _____ Teacher _____ Year _____

Student Name	Previous Modules										This Grade Modules										Following Modules									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1											x	x																		
2												x	x																	
3											x	x																		
4							x																							
5											x	x																		
6										x																				
7															x	x														
8											x	x																		
9											x	x																		
10				x																										
11											x	x																		
12										x	x																			
13											x	x																		
14												x	x	x																
15											x	x																		
16									x	x																				
17								x																						
18											x	x																		
19														x	x	x														
20												x	x																	
21											x	x																		
22											x	x																		
23										x	x																			
24											x	x																		
24														x	x	x	x													
Number of Students				1			1	1	1	4	14	15	3	3	3	3	1													

review of each student's record file. Estimates of individual pupil expected progress can be entered on a chart. Such charts aid the teacher in planning the curriculum for the coming year. Table 5 has been constructed to show the modules which children of a classroom might be expected to complete during the school year. The X's represent expected mastery. For example, students 4 and 10 are projected to progress at a slower pace and will not complete as many modules as other students. On the other hand, students 2, 7, 14, 19 and 25 are expected to complete more modules than the bulk of students. Student 16, who has fallen behind (possible due to illness), is expected to progress a normal ten modules during the year.

Appendix C contains illustrative charts of mastery for children of differing mental ages or I.Q. levels. In these tables the mastery of modules is seen to increase as the mental age or I.Q. rises. The tables in Appendix C are illustrative of a modular system of 10 equal units each year, though the decimals may also represent parts of the whole module that should be earned. Individualized instructional units set up by districts need not have regularly spaced modules during the year, nor contain the same number of modules each year.

Mastery of Expectancy

Neither of the above tables are, alone, sufficient for judging the adequacy of progress of individual pupils. The final step in converting the previous progress module and expectancy tables into an evaluation tool is to merge the two. Table 6 is such a tool. It combines expectancies as X's and actual pupil progress as circles around the X's. Pupil progress is judged by determining how far the children have advanced toward completion of the

Table 5. Expectancy by Module

Grade _____ Subject _____ Teacher _____ Year _____

Student Name	Previous Modules										This Grade Modules										Following Modules									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1											x	x	x	x	x	x	x	x	x	x										
2												x	x	x	x	x	x	x	x	x	x	x								
3											x	x	x	x	x	x	x	x	x	x										
4							x	x	x	x	x	x	x	x																
5											x	x	x	x	x	x	x	x	x	x										
6										x	x	x	x	x	x	x	x	x	x											
7															x	x	x	x	x	x	x	x	x	x	x	x	x			
8											x	x	x	x	x	x	x	x	x	x										
9											x	x	x	x	x	x	x	x	x	x										
10				x	x	x	x	x	x	x																				
11											x	x	x	x	x	x	x	x	x	x										
12										x	x	x	x	x	x	x	x	x	x											
13											x	x	x	x	x	x	x	x	x	x										
14												x	x	x	x	x	x	x	x	x	x	x								
15											x	x	x	x	x	x	x	x	x	x										
16									x	x	x	x	x	x	x	x	x	x												
17								x	x	x	x	x	x	x	x	x														
18											x	x	x	x	x	x	x	x	x	x										
19													x	x	x	x	x	x	x	x	x	x	x	x	x					
20												x	x	x	x	x	x	x	x	x	x									
21											x	x	x	x	x	x	x	x	x	x										
22											x	x	x	x	x	x	x	x	x	x										
23										x	x	x	x	x	x	x	x	x	x											
24											x	x	x	x	x	x	x	x	x	x										
25														x	x	x	x	x	x	x	x	x	x	x	x					
Number of Students				1	1	1	2	3	4	7	18	21	21	23	23	23	22	22	21	18	6	5	3	3	3	1	1			

Table 6. Progress on Expectancy

Grade	Subject	Teacher	Year

Student Name	Previous Modules										This Grade Modules										Following Modules									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1											⊗	⊗	x	x	x	x	x	x	x	x										
2												⊗	⊗	x	x	x	x	x	x	x	x	x								
3											⊗	⊗	x	x	x	x	x	x	x	x										
4							⊗	x	x	x	x	x	x	x																	
5											⊗	⊗	x	x	x	x	x	x	x	x										
6										⊗	x	x	x	x	x	x	x	x	x											
7															⊗	⊗	x	x	x	x	x	x	x	x	x	x	x				
8											⊗	⊗	x	x	x	x	x	x	x	x										
9											⊗	⊗	x	x	x	x	x	x	x	x										
10				⊗	x	x	x	x	x	x																				
11											⊗	⊗	x	x	x	x	x	x	x	x										
12										⊗	⊗	x	x	x	x	x	x	x	x			·								
13											⊗	⊗	x	x	x	x	x	x	x	x										
14												⊗	⊗	⊗	x	x	x	x	x	x	x	x								
15											⊗	⊗	x	x	x	x	x	x	x	x										
16									⊗	⊗	x	x	x	x	x	x	x	x												
17								⊗	x	x	x	x	x	x	x	x														
18											⊗	⊗	x	x	x	x	x	x	x	x										
19														⊗	⊗	⊗	x	x	x	x	x	x	x	x	x					
20												⊗	⊗	x	x	x	x	x	x	x	x									
21											⊗	⊗	x	x	x	x	x	x	x	x										
22											⊗	⊗	x	x	x	x	x	x	x	x										
23										⊗	⊗	x	x	x	x	x	x	x	x											
24											⊗	⊗	x	x	x	x	x	x	x	x										
25														⊗	⊗	⊗	⊗	x	x	x	x	x	x	x	x	x				
Number of Students				1	1	1	2	3	4	7	18	21	21	23	23	23	22	22	21	18	6	5	3	3	3	1	1			

projected year's work. Generally, the students whose progress has been charted on Table 6, have advanced the two modules as expected. Those students who learn more slowly have advanced only one module. Faster learners have advanced more than two modules, with the exception of student 7. The reason student 7 is slowing down should be sought. Is it because of absence due to illness? Could family problems be interfering with school study? In contrast students 14 and 25 have exceeded what might have been expected. Have their projected achievements been misjudged? Is student 14 a late bloomer? These and other questions flow naturally from scanning the table.

Evaluation of total school quality is readily determined by summarizing each teacher's tables on a form such as Table 7. Few students should be found in either the "Above Expected" and "Below Expected" categories. Those that are found in either should be immediately studied. Study of "Above Expected" children may yield clues to program, curricular content, or methodologies that can be used to further the learning of other children. It may also reveal unhealthy pressures for higher achievement. Of course, those found "Below Expected" should be cause for concern.

Expectancy progress tables therefore perform a four-fold function. First, they are a control device whereby teachers are kept continually aware of student abilities and progress. Second, they are alarms which signal unusual academic behavior. Third, they are evaluation devices which provide to both teachers and administrators a method of measuring their effectiveness. Finally, use of expectancy progress tables helps answer the question, "How are my children progressing?"

Table 7. Module Summary Table

Student Progress	Grade																			
	K		1		2		3		4		5		6		7		8		9	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Above Expected																				
Expected																				
Below Expected																				
Total																				

Date of Summary _____ Subject Area _____ School _____

Recap

Several methods of measuring school effectiveness have been offered. Most involve the use of simple arithmetic. Often numbers are placed in chart, graphic or tabular form. Analysis is highly visual. Because the procedures to be followed are simple, they are easily done. Since the method of presentation is for-the-most-part visual, the results of the evaluation are readily understood. The evaluation techniques presented are thus useful to those not interested in a robust, mathematically oriented, statistical analysis. Their strength and their weakness lie in their simplicity.

APPENDICES

APPENDIX A

MENTAL AGE TO MENTAL GRADE CONVERSION TABLE

Derivation of Mental grade scores:

Mental ages are usually expressed in months. /Mental age is the dividend of the I.Q. formula: mental age ÷ chronological age = I.Q.__/. To convert the figure to years, it is divided by 12. Then so it will correspond to the grade for which it normally compares, 5 (five years from birth to beginning of first grade) is subtracted from it. Thus, a mental age of 107, divided by 12 and minus 5 equals a mental grade of 3.9

MENTAL GRADE TABLE

MENTAL YEAR SCORE	MENTAL MONTH SCORE											
	0	.1	.2	.3	.3	.4	.5	.6	.7	.8	.8	.9
0	60	61	62	63	64	65	66	67	68	69	70	71
1	72	73	74	75	76	77	78	79	80	81	82	83
2	84	85	86	87	88	89	90	91	92	93	94	95
3	96	97	98	99	100	101	102	103	104	105	106	107
4	108	109	110	111	112	113	114	115	116	117	118	119
5	120	121	122	123	124	125	126	127	128	129	130	131
6	132	133	134	135	136	137	138	139	140	141	142	143
7	144	145	146	147	148	149	150	151	152	153	154	155
8	156	157	158	159	160	161	162	163	164	165	166	167
9	168	169	170	171	172	173	174	175	176	177	178	179
10	180	181	182	183	184	185	186	187	188	189	190	191
11	192	193	194	195	196	197	198	199	200	201	202	203
12	204	205	206	207	208	209	210	211	212	213	214	215
13	216	217	218	219	220	221	222	223	224	225	226	227
14	228	229	230	231	232	233	234	235	236	237	238	239
15	240	241	242	243	244	245	246	247	248	249	250	251

Directions: Find the mental age figure (expressed as months) in body of table. Go straight left to the left margin to determine the year, then go straight up from the monthly mental age to the upper row for the decimal fraction. For example, a monthly mental age of 128 yields 5th grade on the left and .6 months on the top.

APPENDIX B

SCATTERGRAM SCALE TABLES AND BLANK FORMS

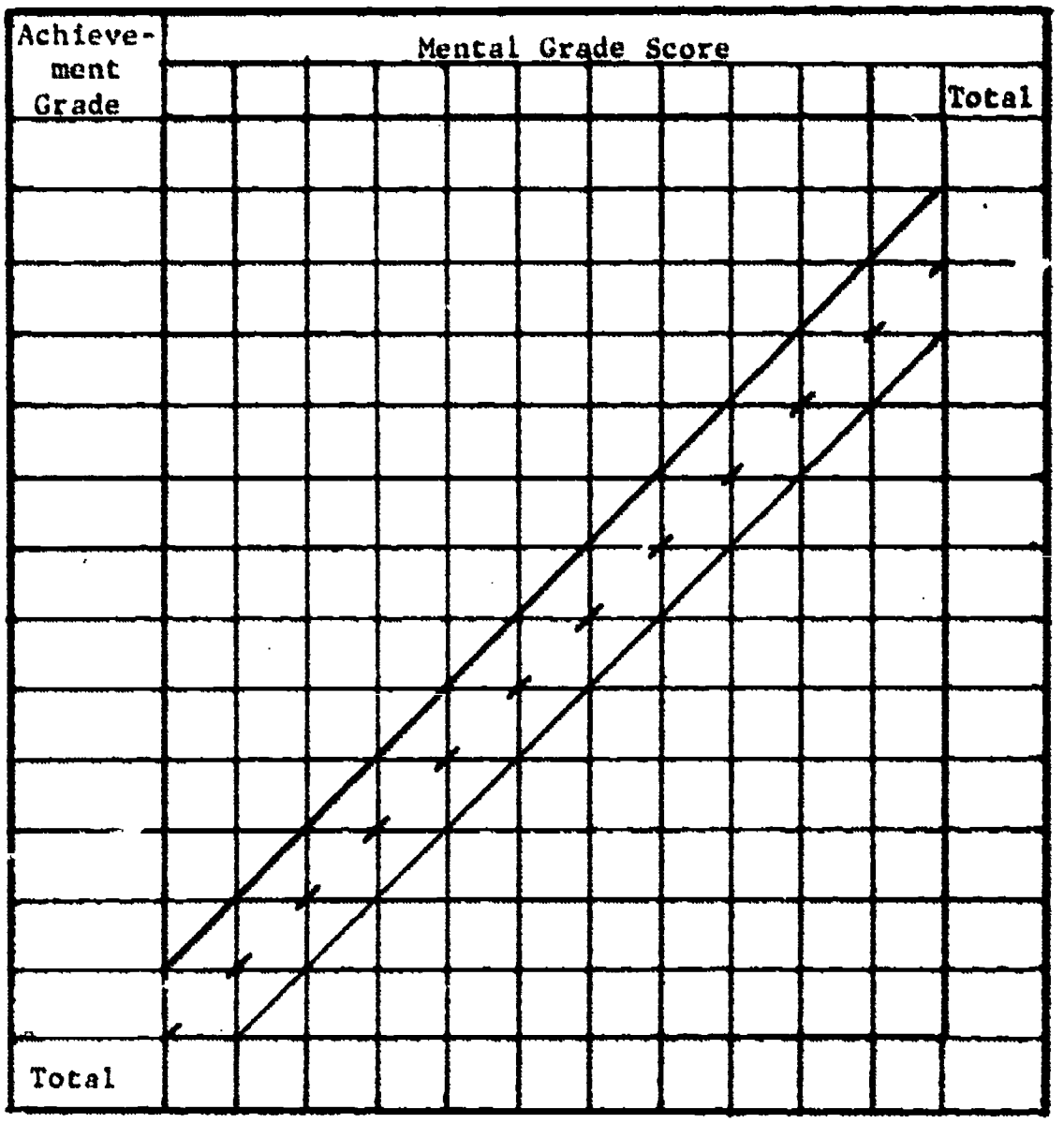
GRADE EQUIVALENT SCALES FOR SCATTERGRAM
ROWS* AND COLUMNS**

Grade	Cell									
	1	2	3	4	5	6	7	8	9	10
1	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2
2	.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4
3	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6
4	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8
5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0
6	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.2
7	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6	14.0	15.4
8	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.4	16.0	17.6
9	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	19.8

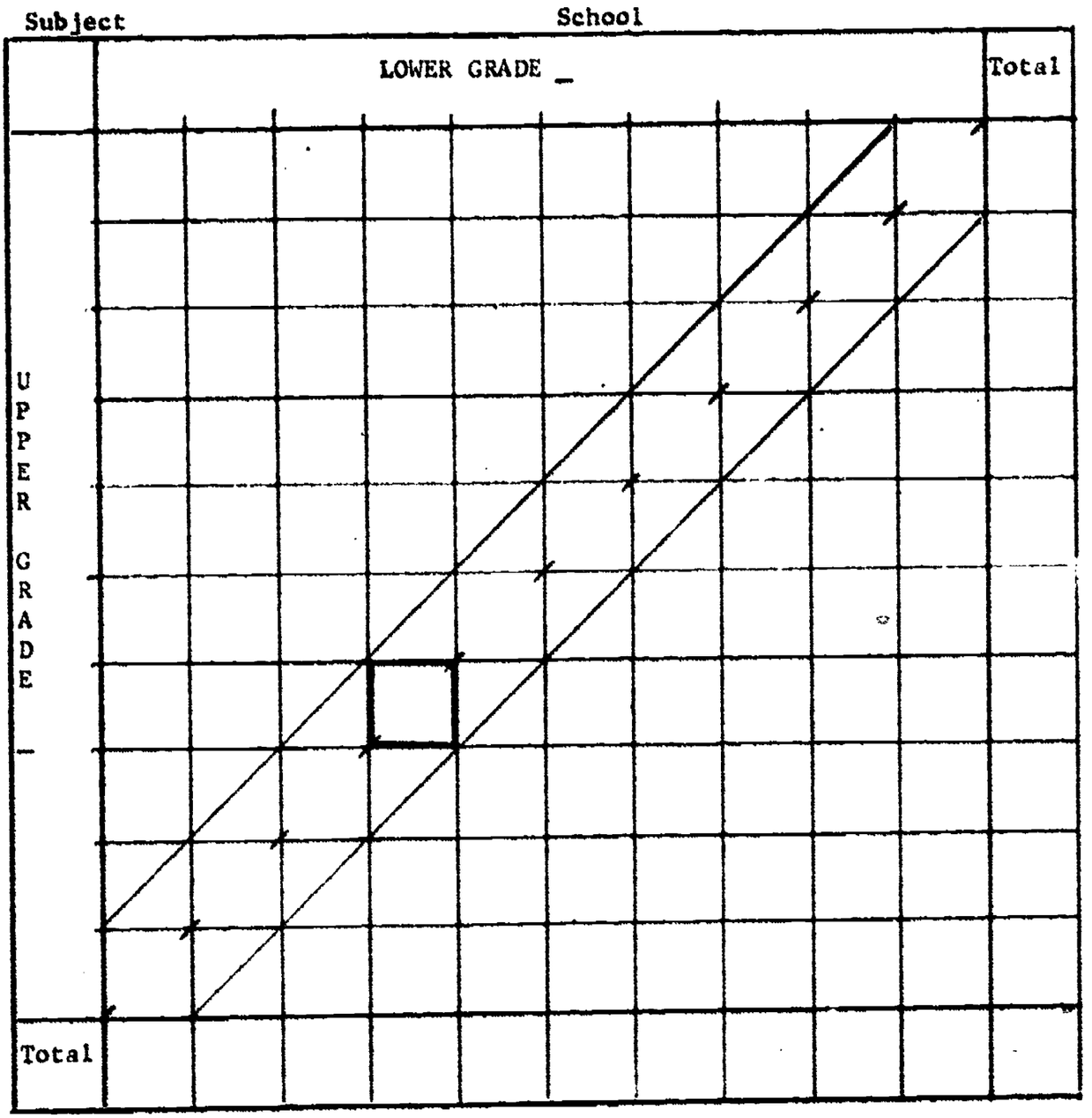
*Row headings are always for the higher of the two grades with the scale on the left running from low values at the bottom to greater values at the top of the scattergram.

**Column headings are always for the lower of the two grades with the scale on the top of the scattergram running from left as smaller numbers to the right in increasingly greater values.

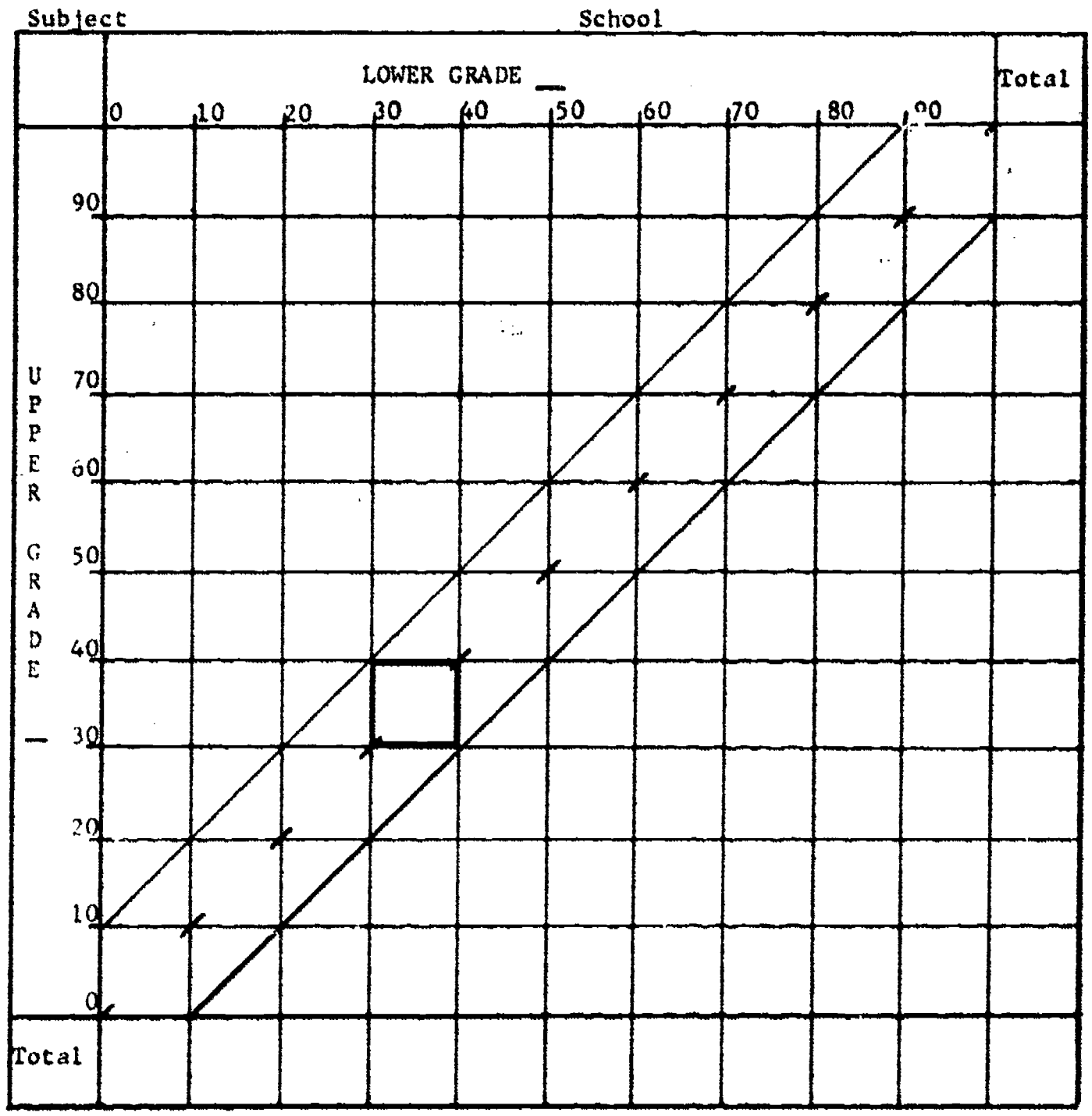
- Scattergrams need not cover closely sequenced grades. Grade 3 versus grade 6, grade 4 versus grade 6, and grade 6 versus grade 9 are also viable uses.



Scattergram of Mental Grade Scores versus Achievement Grade Scores. (Place scales on left and top so same figure junctures on dashed line.)



Grade Equivalent Scattergram
(Place scales on left and top so the grade which is the basis for each scale junctures in the square. See page 20.)



Percentile Scattergram

APPENDIX C

FORMS FOR TREE DIAGRAM ANALYSIS

Contains: Collection Sheets, Synthesis Cards and Forms, and Several Tree Diagram Forms

Highest Level of Parent's Education (Circle)

8 10 12 A B M D Father

8 10 12 A B M D other

Occupation of Principal Wage Earner

Description

Mother

Father

Rating of Occupation: (Circle)

3 - Upper Managerial, Professional, 2 - White Collar, 1 - Blue Collar

Important Incidents & Anecdotes:

School Code_____

Pupil Code_____

Birth Date__/__/__

Sex_____

Other_____

Other_____

Student Personal and Background Information

Group	Percentile	Difference From Avg. Grade Equivalent	Grade					
			1	2	3	4	5	6
Above Average, I	85-99	+2.1 and above						
Average, II	40-84	-.1 - +2.0						
Below Average, III	1-39	Less than -.1						

Achievement Tests, Elementary Level

Group	Percentile	Difference From Avg. Grade Equivalent	Grade					
			7	8	9	10	11	12
Above Average, I	85-99	+2.1 and above						
Average, II	40-84	-.1 - +2.0						
Below Average, III	1-39	Less than -.1						

Achievement Tests, Junior and Senior High Level

Group	Percent	Teacher Grades	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Above Average, I	85-100	A,B						
		E,G						
Average II	75-84	C						
		S						
Below Average, III	1-74	D,E,F						
		U						

Teacher Grades, Elementary Level

Group	Percent	Teacher Grades	Grade					
			7	8	9	10	11	12
Above Average, I	85-100	A, B						
Average, II	75-84	C						
Below Average, III	1-74	D, E, F						

Teacher Grades, Junior and Senior High Levels

Group	Percentile	I.Q. Score	Grade					
			1	2	3	4	5	6
Above Average, I	85-99	115 and above						
Average, II	40-84	100-114						
Below Average, III	1-39	Less than 99						

Group	Percentile	I.Q. Score	Grade					
			7	8	9	10	11	12
Above Average, I	85-99	115 and above						
Average, II	40-84	100-114						
Below Average, III	1-39	Less than 99						

Intelligence Test Record

Front Face

	Achievement Test	I.Q.	Teacher Grades
El.	I II III	I II III	I II III
Jr. High	I II III	I II III	I II III
Sr. High	I II III	I II III	I II III
Overall I.Q.		I II III	

School #_____

Student #_____

Birthdate__/__/__

Sex M F

Other_____

Other_____

Highest Parental Education_____

Highest Parental Occupation_____

Back Face

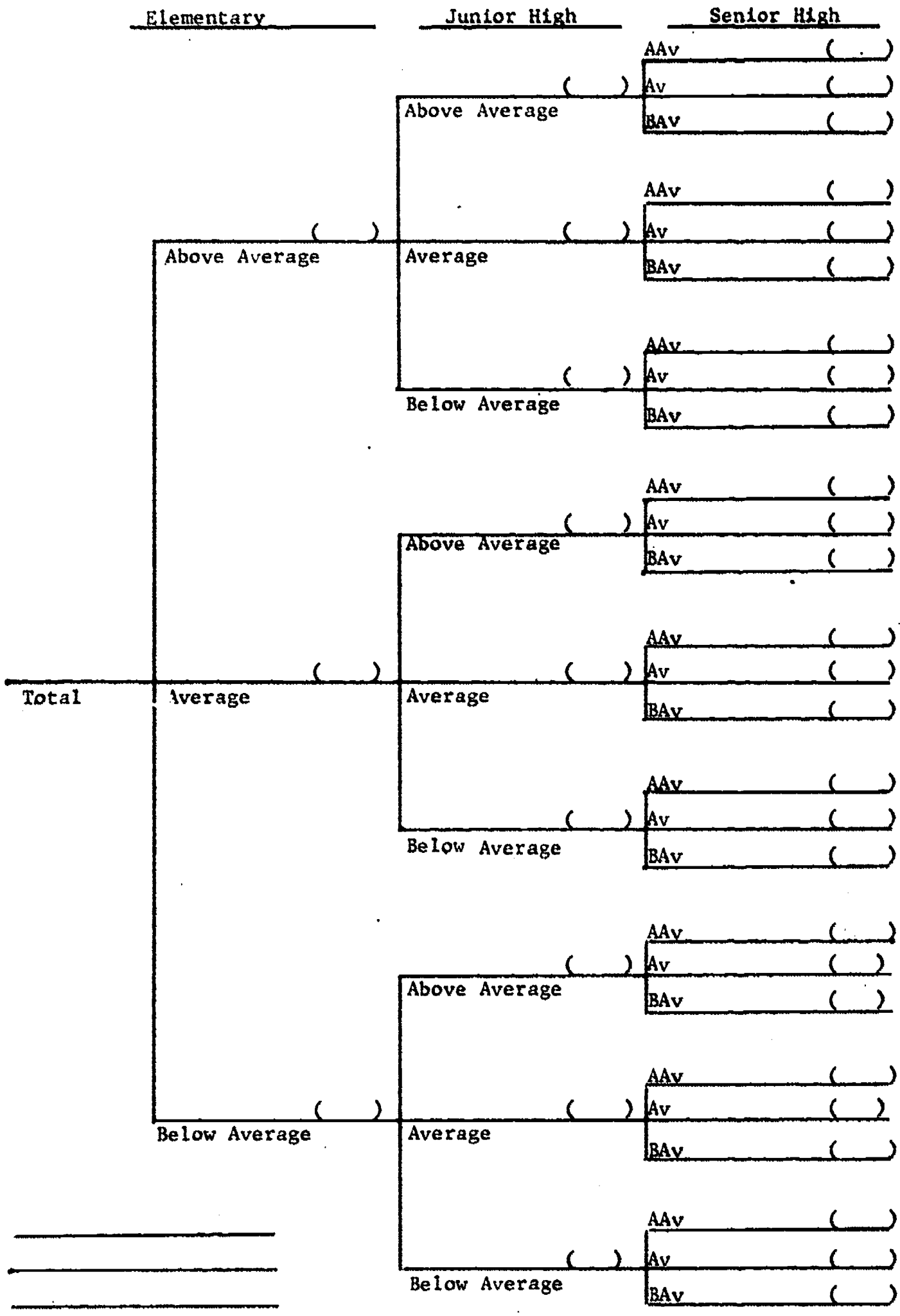
Regents Scores:	Lang.	Science
Eng._____	_____	_____
Soc.St._____	_____	_____
Math 9_____	_____	_____
10_____	_____	_____
11_____	Business: _____	_____
C.E.E.B. V_____	_____	_____
C.E.E.B. M_____	_____	_____

Anecdotes:_____

_____

_____

Summary Sorting Card



CATEGORIES	GROUP	ELEMENTARY		JUNIOR HIGH		SENIOR HIGH	
		N	%	N	%	N	%
________	Above Average		( )		( )		( )
________	Average		( )		( )		( )
________	Below Average		( )		( )		( )
	Total N		( )		( )		( )
________	Above Average		( )		( )		( )
________	Average		( )		( )		( )
________	Below Average		( )		( )		( )
	Total N		( )		( )		( )
________	Above Average		( )		( )		( )
________	Average		( )		( )		( )
________	Below Average		( )		( )		( )
	Total N		( )		( )		( )
________	Above Average		( )		( )		( )
________	Average		( )		( )		( )
________	Below Average		( )		( )		( )
	Total N		( )		( )		( )

Summary Sheet

APPENDIX D

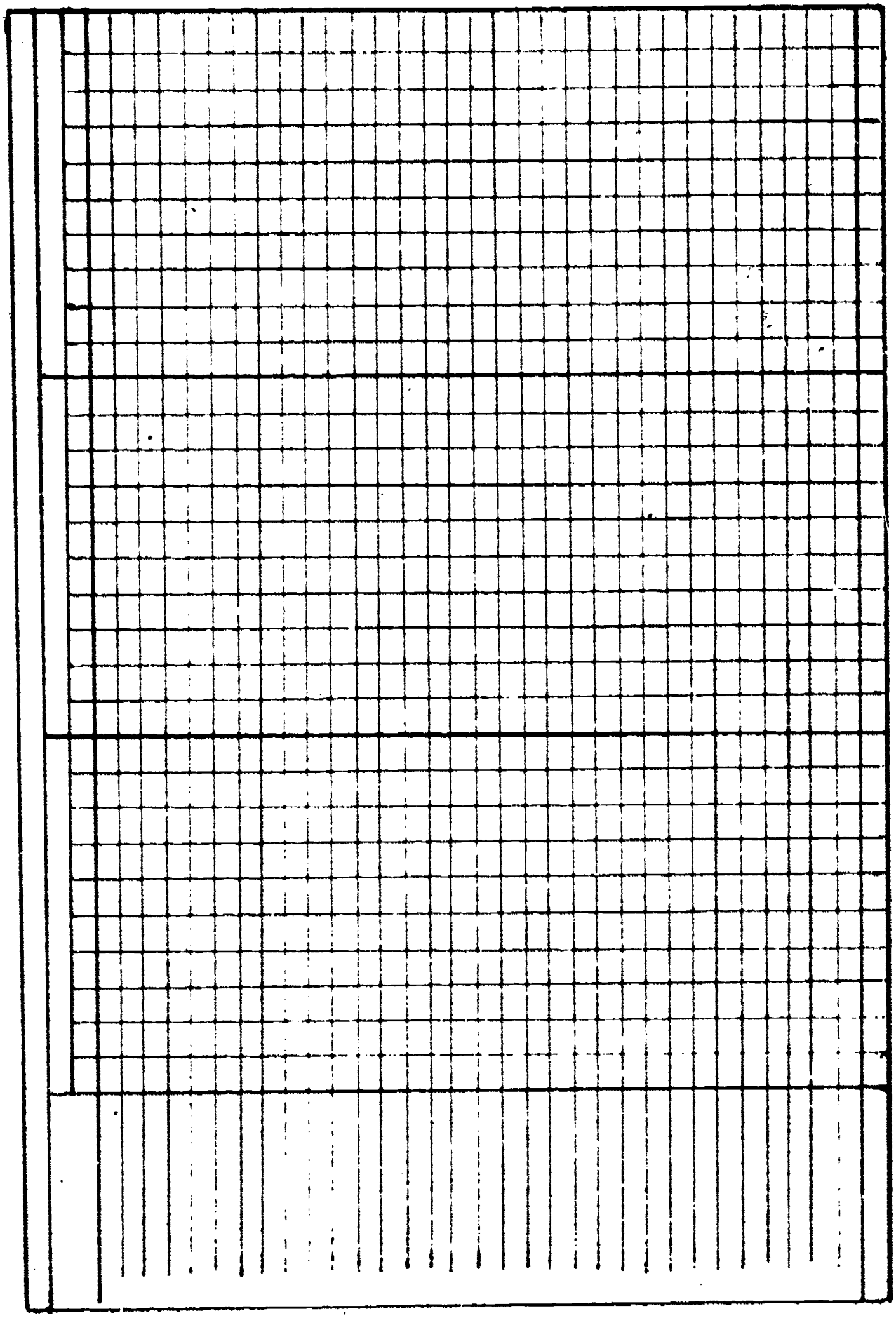
EXPECTATION CHARTS

I.Q.	Units plus Modules per Grade								
	K	1	2	3					
					4	5	6	7	8	9
160	.2	1.6	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.4
155	.2	1.6	3.1	4.7	6.2	7.8	9.3	10.9	12.4	14.0
150	.2	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5
145	.2	1.5	2.9	4.4	5.8	7.3	8.7	10.2	11.6	13.1
140	.1	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6
135	.1	1.4	2.7	4.1	5.4	6.8	8.1	9.5	10.8	12.2
130	.1	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7
125	.1	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3
120	.1	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8
115	.1	1.2	2.3	3.5	4.6	5.8	6.9	8.1	9.2	10.4
110	.1	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9
105	.1	1.1	2.1	3.2	4.2	5.3	6.3	7.4	8.4	9.5
100	.1	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
95	.1	1.0	1.9	2.9	3.8	4.8	5.7	6.7	7.6	8.6
90	.1	.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1
85	.1	.9	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7
80	.1	.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2
75	.1	.8	1.5	2.3	3.0	3.8	4.5	5.3	6.0	6.8
70	.1	.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3

Expectancies by I.Q. and Grade

Mental Age In Years	Grade	K	1	2	3	4	5	6	7	8	9
	22.5										14.5
	22.0										14.1
	21.5										13.8
	21.0										13.5
	20.5									12.6	13.2
	20.0									12.3	12.9
	19.5									12.0	12.5
	19.0								11.1	11.7	12.2
	18.5								10.8	11.4	11.9
	18.0							9.8	10.5	11.1	11.6
	17.5							9.6	10.2	10.8	11.2
	17.0							9.3	9.9	10.5	10.9
	16.5							9.0	9.6	10.2	10.6
	16.0						8.0	8.7	9.3	9.9	10.3
	15.5						7.8	8.5	9.0	9.5	10.0
	15.0						7.5	8.2	8.7	9.2	9.6
	14.5					6.4	7.3	7.9	8.5	8.9	9.3
	14.0					6.2	7.0	7.6	8.2	8.6	9.0
	13.5					6.0	6.8	7.4	7.9	8.3	8.7
	13.0					5.8	6.5	7.1	7.6	8.0	8.4
	12.5				4.7	5.6	6.3	6.8	7.3	7.7	8.0
	12.0				4.5	5.3	6.0	6.5	7.0	7.4	7.7
	11.5				4.3	5.1	5.8	6.3	6.7	7.1	7.4
	11.0			3.1	4.1	4.9	5.5	6.0	6.4	6.8	7.1
	10.5			3.0	3.9	4.7	5.3	5.7	6.1	6.5	6.7
	10.0			2.9	3.8	4.4	5.0	5.5	5.8	6.2	
	9.5		1.6	2.7	3.6	4.2	4.7	5.2	5.5	5.8	
	9.0		1.5	2.6	3.4	4.0	4.5	4.9	5.2		
	8.5		1.4	2.4	3.2	3.8	4.2	4.6			
	8.0	.2	1.3	2.3	3.0	3.6	4.0	4.4			
	7.5	.2	1.3	2.1	2.8	3.3	3.7				
	7.0	.1	1.2	2.0	2.6	3.1					
	6.5	.1	1.1	1.9	2.4	2.9					
	6.0	.1	1.0	1.7	2.3						
	5.5	.1	.9	1.6							
	5.0	.1	.8								
	4.5	.1	.8								
	4.0	.1									
	3.5	.1									

Expectancies by Mental Age and Grade



Blank Module Mastery Chart