

THE CONSTRUCTION AND USE OF SIMPLE EXPECTANCY
TABLES TO COMMUNICATE TEST RESULTS

by

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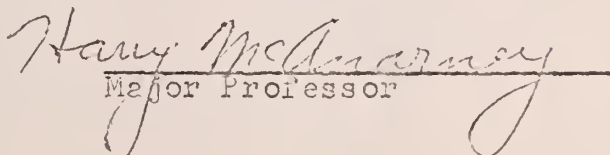
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THE PROBLEM AND DEFINITION OF TERMS

Meaningful interpretation and practical use of standardized test results are two concerns which face schools, teachers, counselors, and administrators. Tests have been administered, results have been tabulated, and correlation coefficients have been computed, but few results have been used in meaningful and useful ways. Practical means of interpreting and using the results of standardized tests are needed for teachers and administrators who lack the necessary background to understand statistical terminology. This was pointed out in Test Service Bulletin as follows:

A device is needed which can simply and directly reveal the relationships between test scores and performance measures to those who lack the necessary background to understand even the more commonplace statistical terms as correlation, standard deviation, and variance.¹

Even though many educators understand the statistical language of test interpretation, the matter of communicating such information to the students and parents would still remain. A coefficient of correlation is meaningless to the great majority of parents when they are

¹Alexander G. Wesman, "Expectancy Tables - A Way of Interpreting Test Validity," Test Service Bulletin, No. 38. New York: The Psychological Corporation, December, 1949, p. 11.

informed of relationships of test results and school progress. "A technique for validating test data which is readily accepted by teachers and parents because it entails percentages and is easily grasped is the expectancy table."²

THE PROBLEM

Statement of the problem. The purposes of this study were (1) to collect grades of students who had graduated from Immanuel Lutheran School, Junction City, Kansas, from 1962 through 1965, (2) to develop expectancy tables which showed the relationship between standardized test results and grades in the eighth grade, and grades earned in the freshman subjects of English, algebra, and science, (3) to propose the use of these tables for the purpose of counseling eighth graders in choosing a program of study for the freshman year of high school, and (4) to explain how these tables would be used when reporting to parents what test results may indicate for their child's future performance in school.

Importance of the problem. Many principals of Lutheran schools involved in the testing program called

²Henry R. Kaczkowski, "Using Expectancy Tables to Validate Test Procedures in High School," Educational and Psychological Measurement, Vol. XIX, No. 4, 1959, pp. 675-677.

TAALEnt Search have been in need of a meaningful device which could be utilized to communicate the results of the tests to students and parents. During the past five years the Lutheran schools of the Kansas District and other districts of the Lutheran Church-Missouri Synod administered the SCAT-STEP Tests of Educational Testing Service, Princeton, New Jersey. Schools were provided with the results of these tests which indicated how the performance of the students and schools compared to the norms of the nation and the Kansas Lutheran schools. Attempts were made to use the results, but often they were only filed for future reference. Expectancy tables as proposed by this study were designed to benefit educators at Immanuel Lutheran School, Junction City, Kansas, and the Lutheran schools in general. The tables served as examples of what could be done with test results and models of how they were constructed, designed, and put to use.

When students left the Lutheran schools, most of them entered public high schools located in their home communities. Besides the usual courses of English, algebra, citizenship, and general science, many high schools also offered accelerated courses in English and mathematics, and opportunities to learn foreign languages. Graduates from the Lutheran schools have looked to their principals, and in many cases their teachers, for advice and counsel

in choosing ninth grade subjects in which they would enroll.

All the graduates of Immanuel Lutheran School, Junction City, Kansas, from 1962 through 1965 took the SCAT-STEP Tests. The results of the tests were used to counsel graduates to enroll in courses which were best fitted for their abilities and capabilities. Advice was given to the students in regard to areas they should emphasize in either the verbal or non-verbal areas of the high school curriculum.

This advice was based on information presented on student report forms furnished by the Cooperative Test Division of Princeton, New Jersey. Student report forms exhibited the results of the various tests in percentile bands in a graphic and understanding way. Students were given a picture of how they compared to the norms of the nation and Lutheran schools in Kansas. The expectancy tables presented in this report gave the students an opportunity to observe how former graduates had fared in the local junior high school.

Most of the graduates of Immanuel Lutheran School enrolled in the Junction City Junior High School, a much larger system than they had been experiencing. Many of them were concerned with adjusting to such a large system and were interested in how they would fit into such a situation. In the past some assurance in regard to expected

grade performance had been given, but had been based on the judgment of how well the student compared to national and local norms. The use of expectancy tables made it possible to give the students an indication of what they might anticipate in regard to grades. Judgments were based on information which applied to former graduates who had completed the ninth grade at the Junction City Junior High School.

Many schools have adopted the practice of parent-teacher conferences. Immanuel Lutheran School's parents and teachers met each fall and spring for fifteen minute conferences. The spring conference dealt with the discussion and reporting of test results. Parents needed to know the results of tests which their children took. "Test results are of no benefit to the student or parents until they have been interpreted by a meaningful and useful method."³ Expectancy tables provided a method to convey to parents, in clear terms and an understandable way, an indication of what to expect from their child in high school. Better communication of test results to parents and to students became possible with the use of expectancy tables.

³Richard D. Slater, "About Those Test Scores," The Texas Outlook, April, 1965, pp. 30-31.

DEFINITIONS OF TERMS

Lutheran. The word Lutheran was used in reference to the Lutheran Church-Missouri Synod.

Kansas District. The term Kansas District referred to one of the districts of the Lutheran Church-Missouri Synod.

TAALEnt Search. The TAALEnt Search Project referred to a joint venture of the Aid Association for Lutherans and the Board for Higher Education of the Lutheran Church-Missouri Synod. In Report on the 1961-1962 TAALEnt Search Project, the purpose was stated as follows:

The Aid Association for Lutherans in the interest of fostering the recruitment of talented young people for professions in the Church provided funds for the pilot study program in the hope that these gifted young people might be discovered in their early education. While recruitment was the establishing purpose of the pilot study, other valuable factors fostered the conception of the idea.⁴

Since that time more results were sent to teachers, administrators, pupils, and parents to evaluate educational intelligence and achievement.

⁴Report on the 1961-1962 TAALEnt Search Project, a joint project of the Aid Association for Lutherans and the Board for Higher Education of the Lutheran Church-Missouri Synod.

Aid Association for Lutherans. This company was the insurance company which provided the financial backing for TAALEnt Search. The AAL in TAALEnt represented the initials of the company.

Expectancy Table. An expectancy table "is a device for estimating an individual's chances of success in some future activity from his present performances on a test."⁵ Bittner and Wilder summarize the meaning of an expectancy table in the following words, "A method of interpreting correlation coefficients."⁶ Lawshe and Bolda gave the following explanation:

. . . an expectancy table is a table of numbers from which one may determine the likelihood or probability that a particular individual or group of individuals will attain a specified definition of "superiority." Similarly, an expectancy chart is a graphic display of data presenting the likelihood or probability of the attainment of some defined level of success, and providing in addition a visual concept of the statistical relationship between the predictor and the criterion. Both are specific to a particular situation, inasmuch as predictive validity is generally situational in nature. Expectancy tables and charts may involve a single predictor, or may be based on composite scores derived from a number of predictors.

⁵"Using Test Results," A summary adapted from the script of a film entitled, Using Test Results by Dr. S. D. Melville, Director of Cooperative Test Division of Educational Testing Service, Princeton, New Jersey.

⁶R. H. Bittner and C. E. Wilder, "Expectancy Tables - A Method of Interpreting Correlation Coefficients," Journal of Experimental Education, March, 1946, pp. 245-250.

Furthermore, they may be empirically constructed directly from the raw data; or they may be theoretically constructed from coefficients of correlation, selection ratios, and related matter.⁷

Expectancy tables or charts presented in this report were the empirically constructed type.

SCAT-STEP Tests. These were tests from the Cooperative Test Division of Educational Testing Service, Princeton, New Jersey. SCAT Tests are School and College Ability Tests. "The principal thing that SCAT 'purports to measure' is a student's ability to succeed in future academic work."⁸ These tests were also described this way:

The School and College Ability Tests . . . designed to aid in estimating the capacity of a student to undertake the academic work of the next higher level of schooling. They measure the two kinds of school-related abilities which are most important in the greatest number of school and college endeavors; verbal and quantitative.⁹

STEP Tests were Sequential Tests of Educational Progress. They were a series of achievement tests defined

⁷C. H. Lawshe and Robert A. Bolda, "Expectancy Charts: Their Use and Empirical Development," Personal Psychology, Vol. 11, No. 3, Autumn, 1958, pp. 353-365.

⁸Scarvia B. Anderson (ed.), 1958 SCAT-STEP Supplement (Princeton, New Jersey: Educational Testing Service, 1958).

⁹A Brief--School and College Ability Tests (Princeton, New Jersey: Educational Testing Service, 1958), p. 2.

in the following statement:

They measure critical skills in application of learning in seven major fields of school and college instruction. They measure these skills in a continuous way from the fourth grade of elementary school through the sophomore year of college. The STEP series makes possible a testing program aimed at the central goal of most teachers - the ability of students to use what they have learned in the classroom.¹⁰

¹⁰A Brief--Sequential Tests of Educational Progress
(Princeton, New Jersey: Educational Testing Service, 1958),
p. 2.

REVIEW OF THE LITERATURE

HISTORICAL BACKGROUND OF EXPECTANCY TABLES

Expectancy tables were already in use during the 1920's. In the late 1930's and early 1940's a more common use of expectancy tables came into existence. During earlier times the use of such tables was reserved for those involved in the testing field. Wesman wrote in Test Service Bulletin, "The expectancy table is not new, it has been known and used in the test field for more than a quarter of a century. But it has not been as widely known or used as it deserves."¹

It was during World War II that the armed forces developed test techniques and used the results of tests to place men in jobs which were best suited to their abilities. Davis reported:

During World War II, the AGCT (Army General Classification Test) was used to measure the general mental ability of millions of Army draftees. The average AGCT scores of men in many occupational groups have been computed and provide interesting evidence of the way men tend to sort themselves into various jobs on the basis of their mental ability.²

¹Wesman, loc. cit.

²Frederick B. Davis, Educational Measurements and Their Interpretation (Belmont, California: Wadsworth Publishing Company, Inc., 1964), p. 132.

Many of the ideas and practices learned or developed in the army were brought into industry and business after the war. Among these ideas was the expectancy table which provided readily understood information in regard to the relationship of test scores to performance. Bingham writes:

As the day approaches when the copy for these paragraphs must be surrendered to the printer, Reign Bittner of Owens-Illinois Glass shows me three beautiful expectancy charts (italics in the original). He and Edward Rundquist must have been pretty busy out there in Toledo these last three years, adapting to industrial practice some of the techniques which proved to be invaluable during the war, when psychologists in each of the Services--the Army, the Air Force, the Navy and its pugnacious component, the Marines--found how necessary it was to throw one's statistical findings into the form of charts or tables of expectancy, if a Major General or a recruit to whom you are showing a test score is to catch on at once and realize what that score means.³

In the literature reviewed it was indicated that the early use of expectancy tables was limited primarily to the armed services and business and industry. It was not until after World War II that such charts were recommended for use in the educational field.

PRINCIPAL SOURCES OF INFORMATION

Expectancy tables. A considerable amount of material has been written on the subject of prediction,

³Walter V. Bingham, "Today and Yesterday," Personnel Psychology, Autumn, 1949, p. 397.

which "in the broadest sense of the word is the primary goal of scientific investigation whether in astronomy, chemistry, psychology, medicine, or education."⁴ The same source, the Encyclopedia of Educational Research, devoted an entire section and a long bibliography on prediction and information related to it. Only two paragraphs and two illustrations were used to present the topic of expectancy tables.

It was discovered that most of the research using such tables or prediction scales, concerned itself with forecasting the success or failure of college students. One such reference was a book by Bloom and Peter in which they discussed the use of academic prediction scales. In the foreword of the book the prime purpose of the study was stated as follows: "The main thesis of the report is that there are three sources of variation in academic grades."⁵ The authors had used prediction scales as the means of presenting their data.

Many of the articles emphasized the simplicity of

⁴"Prediction," Encyclopedia of Educational Research (3rd ed.), (New York: Macmillan Company, 1960), 1038-1047.

⁵Benjamin S. Bloom and Frank R. Peter, The Use of Academic Prediction Scales for Counseling and Selecting College Entrants (New York: The Free Press of Glencoe, Inc., 1961).

using expectancy tables. One of the most helpful sources reviewed was Wesman's article in which he discussed expectancy tables. Written in 1949, the article explained a simple device designed to communicate the meaning of test results. The mechanics of constructing expectancy tables with a single predictor and several samples of such tables were presented in the article. Many of the tests and measurement books that were reviewed cited Wesman's article and/or samples of expectancy tables.⁶

In another article written for Test Service Bulletin, entitled, "Double-Entry Expectancy Tables," Wesman presented the entire matter of expectancy tables again.⁷ Expectancy tables with two predictors were explained and illustrated. Again the emphasis was on the use and construction of a device which presented test results in such a way that "students, parents, or bosses"⁸ could readily understand their meaning.

"Using Test Results," a summary adapted from the script written for the film entitled, "Using Test Results,"

⁶Wesman, op. cit., pp. 11-15.

⁷Alexander G. Wesman, "Double-Entry Expectancy Tables," Test Service Bulletin, No. 56. New York: The Psychological Corporation, May, 1966, pp. 1-9.

⁸Ibid., p. 2.

published by the Cooperative Test Division of Princeton, New Jersey, proposed the use of expectancy tables in connection with SCAT and STEP tests.⁹ Directions for the construction and design of such tables were also given.

Lawshe and Bolda published a particularly interesting and useful article on expectancy charts. In it they presented the need for such charts, among which the following was noted:

(1) the need to be better able to communicate statistical relationships to non-psychologists; (2) the need to provide decision makers with more usable personnel information; and (3) the need to devise techniques which can be successfully used at the operating level by persons not specifically trained in statistical and/or measurement methodologies.¹⁰

They gave a comprehensive definition and a brief historical development of expectancy tables. Also included were directions for making such tables and some general rules and limitations concerning their use.

Communicating test results to parents and students.

Literature concerning the reporting of test results to parents and students was also reviewed. There were two articles which were very helpful. In one written by Ricks, two principles regarding the reporting of test results were

⁹"Using Test Results," op. cit.

¹⁰Lawshe and Bolda, op. cit., pp. 353-365.

emphasized. These two principles explained the parents' right and the school's responsibility regarding the communication of test results.¹¹

The other article found in the Texas Outlook discussed how test scores should be interpreted, what they prove, and who should see them. The same two principles stressed by Ricks were also stated very clearly in this article.¹²

Besides these two articles there were various other references to the subject of reporting test results to students and parents. In almost every instance the authors asked that such reporting be explained in language that parents and students could understand and in a way that could readily show the meaning. Many of the authors indicated that the success of a school's testing program depended on its ability to communicate test results to those who do not understand statistical language in which test results are usually stated.

¹²Richard D. Slater, "About Those Test Scores." The Texas Outlook, April, 1965, pp. 30-31.

DATA USED

All of the data used for this study were taken from the school records of Immanuel Lutheran School, the Junior High School, and the Senior High School of Junction City, Kansas.

GENERAL DESCRIPTION OF THE DATA

The data collected for this report were taken from records for 1954 through 1965. However, the expectancy tables presented in this report used only data which pertained to the graduating classes of 1962 through 1965.

Information was sought for thirty-nine graduates. There was no record of enrollment in the Junior High School for nine of these graduates. Information on the remaining thirty students provided the data used for the tables of expectancy.

The data were of three kinds: ninth grade performance of past graduates, test results of eighth grade students, and eighth grade marks in English, mathematics, and science. Beginning in 1954, Stanford Achievement Tests were administered to all students each spring. The test results were evaluated, interpreted, and then filed for future reference.

TEST SCORES AND SUBJECT GRADES

In 1961 the Lutheran schools in Kansas were asked to participate in TAALent Search along with the Atlantic and Texas Districts of the Lutheran Church-Missouri Synod. During the past five years, beginning in the fall of 1961, tests from the Cooperative Test Division of Educational Testing Service, Princeton, New Jersey, were administered each year. The tests were scored by Educational Testing Service and the schools received the results and a statistical analysis of the results of the Kansas District and other participating districts. Test results were placed on special Student Report forms provided by the Educational Testing Service. The results' were shared with the students and parents in individual conferences. Later the results were filed with each child's cumulative record folder.

Scores on both types of tests were changed to terms which showed educational progress. The Stanford Achievement Test scores were presented in terms of grade level and/or stanines. For the purpose of this report, grade level equivalents were compared to performance measures on the expectancy tables to show the relationship between the two. The scores of the Stanford English and arithmetic achievement tests were compared to grades that graduates of

Immanuel Lutheran earned in English and algebra in the ninth grade of Junction City Junior High School.

The SCAT-STEP Test results were expressed as converted scores, or in percentile bands. Converted scores were used in making the expectancy tables exhibited in this report. Scores of STEP Writing were compared to ninth grade English grades. Scores of STEP Science were compared to ninth grade science grades. Scores of STEP Mathematics were compared to ninth grade algebra grades. SCAT Quantitative scores were compared to ninth grade algebra and science performance marks. Combinations of test scores and/or an eighth grade performance mark, were compared to ninth grade performance.

Grades earned by ninth graders who had previously graduated from Immanuel Lutheran School were taken from the records of the junior and senior high schools. Only the scores and grades of the thirty graduates who enrolled in the Junction City Junior High School were used. This was done because the small number of other graduates who attended other high schools would not justify the construction of comparable expectancy tables. It was also decided that even though the number of students used for the report was small, the results would be of more value, since most of Immanuel's future graduates would attend Junction City Junior High School.

The relatively small number of students' scores and grades involved in making the expectancy tables presented in this report did not make the tables as reliable as if there had been many more scores and grades. However, one purpose of this report was to present a simple device which would give meaning and understanding of test results to those who lack the statistical background of test interpretation. Grades and scores of all students who had graduated from 1962 to 1965 and had completed the ninth grade at the local junior high school, were used for the construction of the tables. Thus, the most complete sample available was used.

The use of the small number also demonstrated that expectancy tables could be used for a small number as well as tables that used a large sample. As more students graduate from Immanuel Lutheran School and enter the local junior high school, the expectancy tables can be revised to include a larger sampling.

PRESENTATION OF EXPECTANCY TABLES

The expectancy tables prepared for this report were of two kinds: (1) the ordinary expectancy table, which relates one predictor to the criterion; and (2) the double-entry table which relates two predictors to the criterion. The following excerpt gave a good summary of both kinds:

The ordinary expectancy table shows in an easily understood display of data how a single predictor such as a test score, for example, is related to subsequent performance to school achievement, success on a job, or some other relevant performance criterion.

The double-entry expectancy table similarly helps the counselor or researcher demonstrate the effect of combining two kinds of information (variables) in predicting performance. Both predictor variables may be test scores--or a test score may be combined with a course grade, or with age, or socio-economic status, or some other useful item of information--or two kinds of non-test data may be combined in the same way.¹

In the material that follows the two kinds of expectancy tables were referred to as single-entry and double-entry expectancy tables.

SINGLE-ENTRY EXPECTANCY TABLES

The tables in this report used test scores for the predictor factor and grades earned in the ninth grade as the performance criterion. After scores and grades were listed

¹News Release from The Psychological Corporation, July, 1966.

beside the names of the pupils, a grid containing a number of cells was prepared. The scores of the test were placed down the left side of the grid and the grades were listed across the top. Once this was completed, a tally was placed in the appropriate cell for each individual student, which showed vertically his test score, and horizontally, his grade or rank on the criterion. (Thus, in Figure 1, a student scoring 271 on the STEP Writing and B in ninth grade English was plotted in the bold-outlined cell.)

Test Scores	Grades in Ninth Grade English				Row Totals
	D	C	B	A	
Above 289		/	/	///	5
270 - 289		///	/// 1	/	12
250 - 269	///	////	//		11
Below 250	//				2
Column Totals	7	10	9	4	30

Mean score 266

FIGURE 1

AN EXPECTANCY GRID SHOWING HOW STUDENTS' STEP WRITING SCORES AND NINTH GRADE ENGLISH GRADES WERE TALLIED IN THE APPROPRIATE CELLS

When the tallying was completed, the tallies in each cell were counted, and this number was recorded in the cell. The numbers in each row were added and the sum was recorded at the right of each row. The numbers in each column were added and the sum was recorded at the bottom of each column. A further check on the accuracy of addition was made by adding the row totals and the column totals. These two totals were the same and equalled the number of students whose scores were being used.

When the work of the expectancy grid was completed the basic data were then ready to be presented in the form of the expectancy table. The expectancy table retained the basic form of the grid. On the table prepared for this report the numbers for each cell were retained and also converted to a per cent of each row. This is illustrated by the following statement about Table I: Of the twelve students who scored from 270 to 289 on STEP Writing, 42% (5 students) earned a grade of C, 50% (6 students) earned a grade of B, and 8% (1 student) earned a grade of A.

All of the single-entry tables prepared for this report contained sixteen cells, four score groups along the left side, and four ratings for the criterion along the top. The number of cells was determined by the number of individuals and the range of the scores or grades. The grades

of the ninth graders ranged from A to D, so it was decided to use the grades of A, B, C, and D. Since the greatest number of scores was thirty, a spread of the few scores over more groups than four would have given more cells with one or no tallies. The score groups were chosen by giving some consideration to the mean scores of the nation, the Kansas District, and the local school. An attempt was made to place two score groups above and two below this mean. On some of the tables the mean fell into the lower middle group and on some the upper middle group. The mean scores which were used, accompanied each table.

EXPECTANCY TABLE I

RELATIONSHIP BETWEEN STEP WRITING SCORES OF THE EIGHTH GRADE AND NINTH GRADE ENGLISH GRADES

Test Scores	Per cent and number (in parenthesis) receiving each grade				Row Totals
	D	C	B	A	
Above 289		20% (1)	20% (1)	60% (3)	5
270 - 289		42% (5)	50% (6)	8% (1)	12
250 - 269	46% (5)	36% (4)	18% (2)		11
Below 250	100% (2)				2
Column Totals	7	10	9	4	30
Mean Score 266					

The single-entry expectancy tables presented in this report used grades that were earned in the ninth grade subjects of English, algebra, and science. Scores of STEP Writing, Mathematics, and Science, and scores of SCAT Verbal and Quantitative were used as the predictors. Four other sample tables were prepared besides Table 1 to illustrate the use of scores and grades for the different subject areas.

EXPECTANCY TABLE II

RELATIONSHIP BETWEEN SCAT VERBAL SCORES OF THE EIGHTH GRADE AND NINTH GRADE ENGLISH GRADES

Test Scores	Per cent and number (in parenthesis) receiving each grade				Row Totals
	D	C	B	A	
Above 279		25% (2)	37½% (3)	37½% (3)	8
270 - 279	16% (1)	17% (1)	50% (3)	17% (1)	6
260 - 269	33% (3)	45% (4)	22% (2)		9
Below 260	43% (3)	43% (3)	14% (1)		7
Column Totals	7	10	9	4	30

Mean score 263

EXPECTANCY TABLE III

RELATIONSHIP BETWEEN STEP MATHEMATICS SCORES OF THE
EIGHTH GRADE AND NINTH GRADE ALGEBRA GRADES

Test Scores	Per cent and number (in parenthesis) receiving each grade				Row Totals
	D	C	B	A	
Above 279			75% (3)	25% (1)	4
270 - 279	20% (1)	60% (3)	20% (1)		5
260 - 269	20% (2)	50% (5)	30% (3)		10
Below 260	50% (1)	50% (1)			2
Column Totals	4	9	7	1	21

Mean score 260

EXPECTANCY TABLE IV

RELATIONSHIP BETWEEN SCAT QUANTITATIVE SCORES OF THE
EIGHTH GRADE AND NINTH GRADE ALGEBRA GRADES

Test Scores	Per cent and number (in parenthesis) receiving each grade				Row Totals
	D	C	B	A	
Above 299			100% (4)		4
290 - 299		33% (2)	50% (3)	17% (1)	6
280 - 289	40% (2)	60% (3)			5
Below 280	33% (2)	67% (4)			6
Column Totals	4	9	7	1	21

mean score 263

EXPECTANCY TABLE V

RELATIONSHIP BETWEEN SCAT QUANTITATIVE SCORES OF THE
EIGHTH GRADE AND NINTH GRADE SCIENCE GRADES

Test Scores	Per cent and number (in parenthesis) receiving each grade				Row Totals
	D	C	B	A	
Above 299			33% (1)	67% (2)	3
290 - 299		17% (1)	83% (5)		6
280 - 289	14% (1)	72% (5)	14% (1)		7
Below 280	42% (5)	33% (4)	25% (3)		12
Column Totals	6	10	10	2	28
Mean Score 281					

DOUBLE-ENTRY EXPECTANCY TABLES

Another simple device used to interpret test results to parents and students was the double-entry expectancy table. Two predictors and one performance criterion were used to construct the tables used at Immanuel Lutheran School. The double-entry tables were very similar to the single-entry tables. What was accomplished with two single-entry tables was presented with one double-entry table. The basic simplicity of the single-entry table was retained. This made it easy to indicate to parents and students how two test scores, or one test score and a previously earned grade predicted future performance.

The procedure followed in making double-entry tables was much the same as that for single-entry tables. A list of students with their grades for both eighth and ninth grades and test scores was prepared. A grid was prepared for a double-entry expectancy table with predictor scores or grades placed along the left side and the top. Each cell on the grid contained grade marks of A, B, C, and D, which referred to grades earned in grade nine. Once the grid was completed, tally marks were placed in the appropriate cells for each individual student. The tally showed, vertically, his test score; horizontally, his eighth grade rank or grade; and in the cell, his ninth grade mark in

English. (Thus, in Figure 2, a student scoring above 279 on the SCAT test, or earning a B in grade eight, and B in grade nine was plotted in the bold-outlined cell.)

SCAT Scores	Eighth Grade English Grades				Row Totals
	D	C	B	A	
Above 279	A	A	A /	A //	A 3
	B	B	B //	B /	B 3
	C	C /	C /	C	C 2
	D	D	D	D	D
270 - 279	A	A	A	A /	A 1
	B	B	B ///	B	B 3
	C	C /	C	C	C 1
	D	D /	D	D	D 1
260 - 269	A	A	A	A	A
	B	B /	B	B /	B 2
	C	C ///	C /	C	C 4
	D /	D /	D	D	D 2
Below 260	A	A	A	A	A
	B	B /	B	B	B 1
	C //	C	C /	C	C 3
	D //	D //	D	D	D 4
Totals	A	A	A 1	A 3	A 4
	B	B 2	B 5	B 2	B 9
	C 2	C 5	C 3	C	C 10
	D 3	D 4	D	D	D 7

FIGURE 2

AN EXPECTANCY GRID SHOWING HOW STUDENTS' GRADES AND SCORES WERE TALLIED IN THE APPROPRIATE CELLS

After the completion of the tallying, the tallies for each ninth grade mark were counted and the number was placed next to the tally mark. Numbers for each score group were totaled and brought to the right side. Numbers of each cell group for each eighth grade mark were totaled and placed at the bottom. The row totals and column totals were added, each giving the same number which also indicated the number of students whose grades were used.

After the grid had been completed the information was transferred to the double-entry expectancy table. Of the double-entry expectancy tables prepared for this report two contained nine cells each, two others each contained eight cells, and one table only four cells. Table VI was prepared from the information presented in Figure 2. Fewer cells were used on Table VI than were used on Figure 2. "Where there are relatively few cases for study, it is self-deceiving to spread them over a large number of cells."³ The grid showed quite a thin spread of scores, so fewer cells were used on the table.

In the same article by Wesman it was suggested that per cents could be stated for each cell. Since the number

³Wesman, "Double-Entry Expectancy Tables," op. cit., p. 7.

for each cell was relatively small, it was decided that a comparison of a small amount of numbers would be as readily understood as per cents. Besides, per cents would tend to exaggerate the reliability of the results.

EXPECTANCY TABLE VI

RELATIONSHIP BETWEEN SCAT VERBAL SCORES OF THE EIGHTH GRADE AND EIGHTH GRADE ENGLISH GRADES, AND NINTH GRADE ENGLISH GRADES

SCAT Scores	Eighth Grade English Grades					Row Total			
	D	C	B	A					
Above 269	A	A	A	1	A	3	A	4	
	B	B	B	5	B	1	B	6	
	C	C	2	C	1	C	C	3	
	D	D	1	D	D	D	D	1	
Below 270	A	A	A	A	A		A	0	
	B	B	2	B	B	1	B	3	
	C	2	C	3	C	2	C	7	
	D	3	D	3	D	D	D	6	
Column	A	A	A	A	1	A	3	A	4
	B	B	2	B	5	B	2	B	9
Totals	C	2	C	5	C	3	C	C	10
	D	3	D	4	D	D	D	D	7

Mean score 263

Double-entry expectancy tables were as easy to prepare as single-entry tables, and they were relatively simple to understand. The relationship of two predictors and a criterion (freshman grades) was presented on one table instead of two. The use of two predictors gave an additional opportunity in some instances to advise parents or students of future performance. For example, in Table VII, a student who had scored low on STEP Mathematics (a measure of achievement) could expect a one out of four chance of receiving a B in ninth grade algebra. However, if the same student scored high on SCAT Quantitative (a measure of school ability), his chances of getting a B were seven out of ten. A further analysis showed that a student whose grade fell into a cell group below 270 on STEP and above 289 on SCAT, had a three out of four chance of receiving a B.

EXPECTANCY TABLE VII

RELATIONSHIP BETWEEN SCAT QUANTITATIVE SCORES OF THE
EIGHTH GRADE AND STEP MATHEMATICS SCORES,
AND NINTH GRADE ALGEBRA GRADES

SCAT Scores	STEP Mathematics Scores				Row	
	Below 270		Above 269		Total	
Above 289	A		A	1	A	1
	B	3	B	4	B	7
	C	1	C	1	C	2
	D		D		D	
Below 290	A		A		A	
	B		B		B	
	C	5	C	2	C	7
	D	3	D	1	D	4
Column Totals	A		A	1	A	1
	B	3	B	4	B	7
	C	6	C	3	C	9
	D	3	D	1	D	4
SCAT Mean 281			STEP Mean 260			

Other double-entry tables were prepared which showed the relationship between eighth grade science grades and STEP Science scores, and grades received in freshman science. Both predictors (measures of achievement) were used to show what could be expected for a mark in ninth grade science. Such tables were used to help students understand what relationship existed between past and future performance on science grades and test scores. The tables also indicated to teachers how their estimates of students' science performance compared to other measures of science performance. Table VIII illustrates such an expectancy table.

EXPECTANCY TABLE VIII

RELATIONSHIP BETWEEN STEP SCIENCE SCORES OF THE EIGHTH
GRADE AND EIGHTH GRADE SCIENCE GRADES,
AND NINTH GRADE SCIENCE GRADES

STEP Scores	Eighth Grade Science Grades				Row	
	Below C	C	Above C		Total	
Above 275	A	A	A	2	A	2
	B	B	B	2	B	2
	C	C	C	1	C	1
	D	D	D		D	
265 - 270	A	A	A		A	
	B	B	B	3	B	5
	C	C	C	1	C	6
	D	D	D	2	D	3
Below 265	A	A	A		A	
	B	B	B	2	B	2
	C	C	C	3	C	4
	D	D	D		D	3
Column	A	A	A	2	A	2
	B	B	B	7	B	9
Totals	C	C	C	1	C	11
	D	D	D	2	D	6

Mean score 268

*This figure includes 1 grade of F

Scores of two types of achievement tests were also compared to a criterion of future performance. This relationship was presented on another double-entry expectancy table. The scores of the two achievement tests (STEP Science and Stanford Science) were used as the predictors and ninth grade science grades were used as the criterion. Table IX presents the relationship.

EXPECTANCY TABLE IX

RELATIONSHIP BETWEEN STEP SCIENCE SCORES AND STANFORD
SCIENCE ACHIEVEMENT TEST SCORES OF THE EIGHTH
GRADE, AND NINTH GRADE SCIENCE GRADES

STEP Scores	Grade Level of Stanford Achievement Tests						Row Total	
	Below 8.0		8.0 - 10.0		Above 10.0			
Above 275	A		A	1	A	1	A	2
	B		B		B	3	B	3
	C		C		C		C	
	D		D		D		D	
265 - 275	A		A		A		A	
	B	2	B	1	B	2	B	5
	C	1	C	2	C	3	C	6
	D	1	D	2	D		D	3
Below 265	A		A		A		A	
	B	1	B	1	B		B	2
	C	2	C	1	C	1	C	4
	D	2	D	1*	D		D	3
Column Totals	A		A	1	A	1	A	2
	B	3	B	2	B	5	B	10
	C	3	C	3	C	4	C	10
	D	3	D	3	D		D	6

STEP Mean 268

Stanford Mean 8.0

*This figure includes one grade F

One additional table was prepared. This table was used with Table VI when illustrating expected performance in English. Table X presented two measures of achievement as the predictors. One was eighth grade English grades, and the other predictor consisted of STEP Writing scores earned in grade eight. Ninth grade English grades served as the criterion.

EXPECTANCY TABLE X

RELATIONSHIP BETWEEN STEP WRITING SCORES OF THE EIGHTH GRADE AND EIGHTH GRADE ENGLISH GRADES, AND NINTH GRADE ENGLISH GRADES

STEP Scores	Eighth Grade English Grades							Row	
	D	C	B	A	D	C	B	A	Total
Above 269	A	A	A	1	A	3	A	4	4
	B	B	B	6	B	2	B	8	8
	C	C	4	C	1	C	C	5	5
	D	D	D	D	D	D	D	0	0
Below 270	A	A	A	A	A	A	A	0	0
	B	B	2	B	B	B	B	2	2
	C	2	C	2	C	C	C	4	4
	D	3	D	4	D	D	D	7	7
Column	A	A	A	1	A	3	A	4	4
	B	B	2	B	6	2	B	10	10
Totals	C	2	C	6	C	1	C	9	9
	D	3	D	4	D		D	7	7

Mean score 266

THE USE OF EXPECTANCY TABLES

Each spring the parents and students of Immanuel Lutheran School shared in the interpretation of test results. The teachers would present the results of the Stanford Achievement tests to the parents at the end of the third quarter. Teachers of grades four through eight also shared the results of the SCAT-STEP tests which had been administered in the fall semester. The SCAT-STEP test results were shared with the students and the parents by means of report forms furnished by the Cooperative Test Division of Princeton, New Jersey. The forms were designed to graphically picture the scores of the various tests in percentile bands based on the national norms.

In the spring of 1965, line graphs were used to show each student's test scores in comparison to the mean scores of the nation, the Kansas District, and the local school. Thus the students and the parents had an opportunity to see the test results in relation to the three norms mentioned. The line graphs along with the presentation of percentile bands gave both the parents and students a good idea of how they might fare in the future. Since SCAT tests were designed for just such a purpose, (correlations between SCAT test scores and future school performance were quite high on some studies that had been made by Cooperative

Test Division) teachers felt confident in making predictions about future performance.

In 1966 expectancy tables (based on relationship of eighth grade performance to ninth grade performance) were prepared for presentation to students and parents. The tables were based on data of students who had graduated from Immanuel Lutheran School and had attended Junction City Junior High School.

TEACHER'S ROLE WITH EXPECTANCY TABLES

At first the teachers were a bit reluctant to use a new device to illustrate the relationship between two performance measures. When it was discovered that correlation coefficients would not be needed and that enough knowledge about tests and measurements could be remembered, the task was not as difficult as had been anticipated.

Once it had been decided to use such expectancy tables, the chore of collecting and assembling data began. Permission from the local principals of the junior and senior high schools to secure grades of former students was sought and granted. In a relatively short time all grades and test scores of the graduates of the four years from 1962-1965 were assembled and ready to be placed on the working tables or grids.

The teachers were better informed about the meaning of test results after they had completed the expectancy tables. Use of the tables made it much easier for the teachers to speak with confidence and competence when they later met with parents and students. Teacher interest in parent conferences increased when they knew that parents and students would be able to understand test results.

USING EXPECTANCY TABLES WITH STUDENTS

Students of junior high age, an age concerned about standing among their own peer group, were quite interested in how they might possibly perform in the future. Most of them probably had a good estimation of what they could do, but when expectancy tables showed actual ninth grade performance compared to test scores of former students, the whole matter took on a greater significance.

Students who were average in achievement, but showed a greater potential, were shown what possible performance they might expect in the ninth grade. If the table that was being used indicated a good chance of getting an above average grade, the student was challenged to make the effort required for such a mark. If the chances of success were low, the student was encouraged to do his best and seek extra help from teachers and parents to give a satis-

factory performance. If the table showed that a low scoring student would have no chance of receiving passing grades in algebra, the student was advised to take ninth grade arithmetic. Most of these recommendations were based not only on the data found on the expectancy tables, but also on personal knowledge of the student's background, disposition, ambition, or other qualities.

Students were also advised that test results were only an indication of their knowledge or ability. Changes in their lives could affect the entire situation.

USING EXPECTANCY TABLES WITH PARENTS

It was mentioned earlier that parents met with each of their children's teachers every spring for fifteen minute conferences. Parents looked forward to these conferences. They were interested in knowing how their children had performed on tests which were administered each year. A record of each child's performance was prepared which showed the comparison from one year to the next. Parents were also given a copy of the student's report which showed their child's performance in percentile bands.

Expectancy tables were introduced at a parent-teacher league meeting. An enlarged expectancy chart was prepared to present the basic idea of an expectancy table

and to illustrate the proposed use at future parent conferences. Thus, parents were provided with advance information of what they could expect at the conference with their child's teacher.

Once the tables were introduced to the parents, it was easy to use them at a conference. Many of the same observations were made for the parents as were made for the students. Parents were urged to help students who would face problems in the ninth grade in regard to performance. When a student's chances of success were high, parents were apprised of this and were asked to help their child develop the ability which was apparent.

When parents had already decided that a son or daughter was to take their "special subject," they were advised on the basis of the child's expected performance. If there was an indication that a student would have a very poor chance of succeeding in the subject and it could be avoided, the parents were encouraged not to insist on having the child take the subject.

Parents were cautioned about the use of the information of test results and were informed about the limitations of tests and their results. They were also reminded that tests were just one of the many tools available to help students realize their full potential.

CONCLUDING COMMENTS

The construction and use of expectancy tables in which test scores of eighth grade students were compared to ninth grade performance has suggested other uses. Simplicity of making and using the tables would make them especially attractive for use with less sophisticated data. An example could be the relationship between the results of teacher made tests and grades of a certain subject, or the relationship of a student's past and present performances. Such tables would be of more value to the teacher than to the student or parent.

Another example would be tables that are prepared by the sixth grade teacher for use at a fall conference. Such a table might use test results and grades from sixth grade classes of previous years. On the basis of these relationships the teacher could indicate to parents what they could expect by the end of the year and so advise what course of action might be taken to encourage better performance or to continue present performance. Many other examples could be cited, but the ingenuity of teachers will dictate what use will be made.

The use of expectancy tables, as presented in this report, demonstrated that important information can be communicated with a simple device. Very often this is the

only way it can be communicated to people who have not learned a more sophisticated type of interpretation. Many test results have gone into the files or gone unnoticed because educators felt they were too difficult to explain, or because they could not think of a simple method of presenting the results.

It is hoped that this study of simple expectancy tables will help some other teachers discover or re-discover an easy method to communicate test results. As an end result it is hoped that students will be encouraged, challenged, and helped to use the abilities and gifts they have received from God, their Creator.

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ABSTRACT

THE CONSTRUCTION AND USE OF SIMPLE EXPECTANCY
TABLES TO COMMUNICATE TEST RESULTS

by

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AN ABSTRACT OF A MASTER'S REPORT

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The purpose of this report was to explain the development, construction, and use of simple expectancy tables which were prepared for Immanuel Lutheran School, Junction City, Kansas. To accomplish this, it was necessary to collect and assemble scores and grades of former students, and do library research. The completed tables showed the relationship between scores on standardized tests given in the eighth grade and grades earned in ninth grade subjects.

Each fall and spring tests were administered and scored. An attempt was made to communicate their meaning to students and parents, but most of the results were never used. One of the reasons for not using the results was the lack of a simple device to communicate such information in a meaningful and understandable way. Single and double-entry tables were developed to meet the need.

Only a limited amount of literature was available on expectancy tables. Articles were reviewed which presented sample tables, explanations of their construction and use, and some historical background. A few articles were read which discussed the matter of communicating test results to parents and students.

Three kinds of data used for this report were eighth grade test scores, eighth grade subject grades, and ninth grade performance in English, algebra, and science. Eighth

grade scores and grades were obtained from the records of Immanuel Lutheran School. Ninth grade performance marks were secured from the Junction City Junior and Senior High Schools.

Five single-entry and five double-entry tables were constructed from the data. Each single-entry table related one predictor (test score) to the criterion (ninth grade performance), and each double-entry table related two predictors to the criterion. Once the data were assembled, a grid was prepared on which the vertical axis was used for the predictor and the horizontal axis was used for the criterion. Scores or grades were tallied in the appropriate cells of the grid. Information from the grid was transferred to the single-entry table. When constructing the double-entry tables, both axes were used for predictors and each cell was divided to accommodate the scale of the criterion.

Expectancy tables were used to share results with parents and students by showing them what chance of success the student might have if he enrolled in a ninth grade subject of English, algebra, or science. Statistical terminology was not needed to communicate the meaning of test scores. Teachers who lacked background knowledge in testing were able to prepare and use the tables.

The use of expectancy tables as presented in this report, demonstrated that important information can be communicated with a simple device. Very often this is the only way such information can be communicated to people who have not learned a more sophisticated type of interpretation. Many test results have been placed into the files or gone unnoticed because educators felt they were too difficult to explain or because they could not think of a simple method of presenting the results.

