DOCUMENT RESUME

ED 128 364 TM 005 486

TITLE	Educators Look at Mathematics Results; Summary of Findings by the Richfield Mathematics Data Analysis Committees.
INSTITUTION	Richfield Public Schools, Minn.
PUB DATE	May 76
NOTE	77p.; For a related document, see TM 005 485
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Academic Achievement; Academic Standards; Age Differences; Cluster Analysis; Data Collection; *Educational Assessment; *Elementary Secondary Education; Mathematical Applications; Mathematical Concepts; Mathematical Vocabulary; *Mathematics; Problem Solving; *Program Evaluation; Program Improvement; School District Autonomy; *School Districts; Sex Differences; Socioeconomic Status; Statistical Analysis; Student Attitudes; Student Evaluation; Teacher Participation; Test Results
IDENTIFIERS	Minnesota (Richfield); *Richfield Educational Assessment Program

ABSTRACT

The Richfield Educational Assessment Program is a districtwide effort to collect specific information about the knowledge, skills, understandings, and attitudes of students in selected areas. The information collected will be used to help Richfield citizens and educators make decisions for program improvement. The program closely parallels the Minnesota Educational Assessment Program, but it allows a local district to analyze the performance of its own students. Before the assessment, teachers set the standards for student performance; Richfield was the first district in the nation to set local standards, or expectation levels, for performance on items used in both the national and state assessments. The 1974-75 program evaluated 9- , 13- , and 17-year-olds in five cognitive areas of mathematics skills: recall and recognition, performing mathematical manipulation, understanding mathematical concepts and processes, problem solving, and analyzing problem situations. (BW)

TABLE OF CONTENTS

PERFORMANCE BY AGE GROUPS

F O R E W O R D

Program evaluation continues to be one of the major thrusts of the Richfield Public Schools. The Board of Education has demonstrated support by endorsing a variety of evaluation and assessment related activities. The Richfield Educational Assessment Program (REAP) is an excellent example of our attempts to objectively analyze our instructional program.

This report is the result of a cooperative effort of several agencies and individuals. Various offices of the Minnesota Department of Education have worked closely with Richfield staff in planning and conducting these assessment activities. The mathematics data analysis committees are to be commended for their diligent efforts in compiling this document from hundreds of pages of statistical information. This cooperative spirit has become one of the most significant aspects of our assessment program. Special credit must be given to Ivan Ludeman, REAP Project Director, for the coordinating and production of this report.

The purpose of the Richfield Educational Assessment Program is to help bring about beneficial change within the Richfield Schools. This report marks an important step in the fulfillment of that purpose. The strengths and weaknesses in our students' mathematics performance reported here will serve as the basis for recommendation for future program modification.

Carlton W. Lytle

CARLTON W. LYTLE
Superintendent
Richfield Public Schools

B A C K G R O U N D I N F O R M A T I O N

1. What is the Richfield Educational Assessment Program (REAP)?

   REAP is a districtwide effort to collect specific information about the knowledge, skills, understandings and attitudes of students in selected subject areas. Reading was assessed during the 1973-74 school year, and mathematics was assessed during the 1974-75 school year. The information collected through these assessments is being used to help Richfield educators and citizens make decisions for program improvement.

2. Is this assessment program strictly a local effort?

   No. REAP closely parallels both the National Assessment of Educational Progress (NAEP) and the Minnesota Educational Assessment Program (MEAP). Richfield is now receiving federal monies to continue this local project and is working closely with the Minnesota Department of Education. This cooperative effort provides experience and resources not typically available to local school districts.

3. If there are national and statewide assessment programs, why do we need one in Richfield?

   The national program reports its findings on a nationwide and regional basis only; the Minnesota program reports its findings by ten geographic regions within the state and by specific groups of districts (rural, suburban and city). This does not permit a local district such as Richfield to analyze the performance of its own students.

   The 1973 state legislature authorized a "piggyback" option, which permits an individual school district to use basic state assessment materials to assess local performance. Information about Richfield's performance

levels is useful for purposes of comparison with other districts. These decisions require that the performance of Richfield students be related to information concerning the characteristics of the present instructional program and the present student population in Richfield. Such information must be gathered and interpreted by means of a local assessment program. REAP has been designed to include this feature and thus to provide a sound basis for program decisions aimed at our ultimate goal, improvement in the performance of Richfield students.

4. What makes REAP unique?

Richfield was the first school district in Minnesota to take advantage of the "piggyback" option. To our knowledge, Richfield is also the first district in the nation to set local standards, or expectation levels, for performance on items used in both the national and state assessments. Perhaps the most exceptional characteristic of this study is the amount of teacher involvement. Before the assessment, teachers reviewed and helped to establish districtwide, kindergarten through grade twelve, mathematics goals and objectives and teachers set the standards for student performance. Following the assessment, teachers are involved in the analysis and interpretation of results and in the formulation of recommendations relating to the instructional program.

DESIGN AND IMPLEMENTATION OF THE RICHFIELD MATHEMATICS ASSESSMENT

5. What model was established for the Richfield Mathematics Assessment?

REAP is a comprehensive assessment program designed to provide information to local decision makers for curriculum improvement and since REAP is a Title IV/III, Part C federally funded project, it is to serve as an exemplary model for other local agencies. The results of the assessment will also provide a benchmark against which changes in performance can be assessed over time.

Design

The design chosen for the Richfield Educational Assessment Project (REAP) parallels the one used by the Minnesota Educational Assessment Program (MEAP). The general model employed by MEAP served as a basis for activities related to the variety of data gathering instruments employed in REAP.

Instrumentation

Richfield adapted the statewide assessment instruments to its local assessment. The state assessment instruments adapted for use in REAP were as follows: 1) a set of mathematics objectives for each of the age groups measured; 2) exercise packages designed to measure student performance; 3) student questionnaires designed to collect data concerning student biographic information, experience in mathematics classes and attitudes toward mathematics; 4) school questionnaires which were used to collect data about mathematics programs and school variables hypothesized to be related to mathematics performance. In addition to these instruments, Richfield designed its own model for setting teacher expectations for student performance.

Objectives

The structure of objectives remained consistent across ages, with emphasis given at appropriate age categories. The objectives covered five cognitive levels. The definition of cognitive levels include the following:

I. Recall and Recognition

II. Performing Mathematical Manipulation

III. Understanding Mathematical Concepts and Processes

IV. Problem Solving

V. Analyzing Problem Situations

Items appropriate to the age level for assessing student performance were generated for each objective.

6. What kinds of information do Richfield teachers supply?

For each item in the exercise teachers are asked to state beforehand three levels of teacher expectation outcomes for Richfield student performance. The desired outcome is that percentage of students teachers would expect to answer the item correctly if mathematics instruction and performance were optimal. The minimal acceptable outcome is that percentage which would indicate that the skill is being learned at a low level of acceptability. The predicted outcome is that percentage of students the teachers actually expect to respond correctly. A more detailed explanation of this concept is given in item ten, under definition of terms.

7. Who is being assessed in the Richfield Educational Assessment Program?

As in the National and State Assessment, 9-, 13- and 17-year-olds were chosen as the three age groups to assess. All 9-, 13- and 17-year-olds in the Richfield Public Schools were included in the mathematics assessment during the 1974-75 school year, which included 452 9-year-olds,

638 13-year-olds and 686 17-year-olds. Table 1 contains student participation data. The table indicates that of the students selected, 93.0 percent of the nine-year-olds, 93.4 percent of the thirteen-year-olds, and 85.9 percent of the seventeen-year-olds participated.

TABLE 1

RICHFIELD STUDENT PARTICIPATION

PARTICIPANTS	9	13	17
Students Selected	486	683	799
Students Participating	452	638	686
Students Not Participating	34	45	113
Student Participation Rate	93.0%	93.4%	85.9%

Table number 1 includes 9-year-old students participating from grades two through five, 13-year-olds participating who were in grades six through nine, and 17-year-olds participating who were in grade nine. This table does not include those students, which explains the difference in total participants in Table 1 as compared to Table 2.

TABLE 2

STUDENT PARTICIPATION BY GRADE

RICHFIELD 9 YEAR OLDS

Number of students taking the assessment

Grade 3	173
Grade 4	269
TOTAL 9 YEAR OLDS	442

RICHFIELD 13 YEAR OLDS

Number of students taking the assessment

	East Junior High	West Junior High	Total
Grade 7	124	105	229
Grade 8	191	215	406
TOTAL 13 YEAR OLDS			635

RICHFIELD 17 YEAR OLDS

Number of students taking the assessment

Grade 10	80
Grade 11	588
Grade 12	16
TOTAL 17 YEAR OLDS	685

8. How was the data collected?

The mathematics assessment data was collected for each building. Each participating private parochial school collected and received data for their school and each public school collected and received data for their building.

Administration of the assessment instrument was done by trained administrators used in the statewide assessment project. For uniformity and standardization of administration and in order to insure that the tests were measuring achievement in mathematics rather than reading, all test items were presented to students on paced tapes, as well as in the written form.

Each participating nine-year-old was asked to complete both packages of mathematics exercises; thirteen- and seventeen-year-olds were asked to complete one package of exercises. Administration of the exercises was identical to that of the statewide program. The exercises were administered to the thirteen-year-olds on December 3 and 4, 1974; the nine-year-olds between February 2 - March 13, 1975, and the seventeen-year-olds on April 22, 1975.

The Richfield senior high school and the two junior high schools each had teacher expectation committees which set student performance standards for their buildings. A district elementary teacher expectations committee set districtwide nine year old student performance standards for the Richfield elementary schools.

The State Department of Education provided districtwide nine year old data and also a computer print-out of nine year old data for each elementary building. Each junior high school and the senior high school received data and a computer print-out of student performance information.

ANALYSIS PROCESS

9. What criteria was used in the analysis?

Results and analysis are reported based on three groupings of exercises: by cluster, by objective and by item. As was described earlier in the report, exercises were generated to measure specific objectives. The compilation of exercise results for each objective served as the unit of analysis for interpretation of student performance. Because several objectives and individual exercises fall into more generic categories, an additional grouping of exercises was done by the State Department of Education. In addition to the Richfield student performance data received for each building, as indicated above through a contract with with the State Department of Education, Richfield received the following criterion and comparative measure data for each of the age levels assessed:

- Richfield student performance for each building compared to Richfield teacher student performance standards.
- Richfield student performance compared to Minnesota student performance.
- Richfield student performance compared to Minnesota similar district student performance.
* Richfield student performance compared to U. S. student performance on the NAEP items.
* Richfield student performance compared to U. S. similar district student performance on the NAEP items.
- Student performance in each building compared to Minnesota student performance.
- Student performance in each building compared to Minnesota similar district.

*Items used in the Minnesota/Richfield assessment instrument obtained from the National Mathematics Assessment Instrument.

10. Definition of terms.

The analysis of data requires an understanding of the terminology used in the reported data. The following list presents some of the terms and definitions more commonly used:

Similar district - All Minnesota suburban districts in the seven county metropolitan area.

P-value - The percent of students responding correctly to an item or objective. (For objectives, it is the mean of the correct responses to all items measuring a particular objective.)

Standard error of differences - S. E. of differences is a statistic derived to calculate the T-type ratio.

T-type ratio - If the T-type ratio is $\pm$ 1.96 or greater, it is significant at the .05 level This means that the difference could occur by chance no more than five times out of one hundred times.

Teacher expectations - Part of the Richfield mathematics needs assessment is to obtain "desired outcomes". Desired outcomes or teacher expectations determine a relative standard for Richfield student performance on those exercise items administered in mathematics. The difference between this set of standards and student performance constitutes a discrepancy. Needs and strengths according to this criterion were established and are reported for each item and each objective in this report. Three levels of teacher expectation were established: a minimal acceptable outcome, a desired outcome and a predicted outcome. The minimal outcome might be viewed that if the percent of Richfield students responding correctly to the item/objective were above this expectation percentage, the teachers would feel rather satisfied about the instruction of the mathematics skill measured by that item. The

desired outcome might be viewed that if the percent of Richfield students responding correctly to the item were above this expected percentage, the teachers would feel rather satisfied about the instruction of the mathematics skill measured by that item/objective. The predicted is the percent of Richfield students at the age level being assessed teachers believe would respond correctly to a particular mathematics item. To determine expectation outcomes, teachers were asked to consider the level of mathematics instruction in Richfield, as they perceive it, the importance a particular item/objective has in our curriculum, along with the difficulty of the item/objective in terms of both the general abilities of 9, 13 and 17 year olds and the ability of 9, 13 and 17 year olds to master the particular item with the present mathematics instruction.

Below are examples of two mathematics problems used in the assessment and grids used in recording teacher expectations:

9-year-old teacher expectation; package 1, item 10.

Which fraction is GREATEST? O $\frac{2}{3}$ ● $\frac{4}{5}$ O $\frac{5}{8}$ O I don't know

Indicate your estimates for here:

Percent	10	20	30	40	50	60	70	80	90	100
Minimal										
Desired										
Predicted										

Word problem; package 2, item 41

Marie took four spelling tests. Each test had 30 words. On the four tests she spelled correctly the followirg number of words: 25, 23, 27 and 24. Altogether, how many words did she MISS on all four tests?

ANSWER _____

Indicate your estimates for here:

Percent	10	20	30	40	50	60	70	80	90	100
Minimal										
Desired										
Predicted										

Cluster - Because several objectives and individual exercises fall into more generic categories, which are viewed as consistent with common curricular designations, an additional grouping of exercises was compiled. Each of these clusters incorporates several objectives and provides a sufficient number of exercises within clusters to allow maximum generalization of results. The compilation of exercise results for each cluster constitutes a unit of analysis for interpretation.

Needs-Strengths - Needs-strengths classifications were used for reporting both the criterion (teacher expectations) and comparative data. Since comparative data results were reported as a statistic based on the T-type ratio, a confidence interval was established for each needs-strength classification. This confidence interval can perhaps be most easily interpreted by the use of a number line as indicated in the following:

SN	SIGNIFICANT NEED	SS	SIGNIFICANT STRENGTH
N	NEED	S	STRENGTH
PN	POTENTIAL NEED	PS	POTENTIAL STRENGTH

SN N PN. ACCEPTABLE PS S SS
-2.0---------- -1.50---------- -.50---- 0 ----- .50---------- 1.50---------- 2.0

Needs-strength classifications according to the teacher expectations criterion became a judgmental decision. Each data analysis committee: the districtwide nine year old analysis committee; the West Junior High; the East Junior High and the Richfield Senior High School committee evaluated each item and each objective using the P-value and compared that statistic to the teacher expectations for each item. The base for determining the needs classifications was the minimal level of teacher expectations. As the P-value of an item or objective approached the predicted and desired teacher expectations levels, it became a strength classification. As indicated earlier, this became a judgmental decision and is proving to be one of the strengths of a criterion based evaluation model.

11. How was the mathematics assessment information analyzed?

A mathematics data analysis committee was established for each secondary and each elementary school. A district data analysis committee was established at the elementary level to analyze and report the 9-year-old data on a districtwide basis.

12. How will the information in this report be used?

The analyzed data will be used to better enable Richfield educators to improve the mathematics program. It will be distributed to all Richfield

faculty. It will be made available to the public at large and since this project is a Title IV/III, Part C federally funded project, it will be made available, as an exemplary model, to any local agency or interested party.

GENERAL FINDINGS

13. On the whole, how well do Richfield students do in math?

Richfield students did very well on the mathematics assessment. Overall, they performed about as well as Richfield teachers had predicted they would. The teacher expectation on desired outcome was, in most cases, high than actual student performance. Student total performance was significantly better than that of students throughout Minnesota and except for 17-year-olds, better than that of students in Minnesota districts similar to Richfield. Richfield student performance, on the exercise items adopted from the National Assessment instrument, exceeded the performance of their counterparts for the nation as a whole.

14. How does the mathematics performance of Richfield students compare with that of students in the nation as a whole?

As indicated earlier, several exercise items contained in the Minnesota statewide mathematics assessment instrument were used in the National Mathematics Assessment of Educational Progress (NAEP). In general, the results show that on these NAEP mathematics items, Richfield 9-, 13- and 17-year-olds, like other Minnesota students, performed well above the nation as a whole.

15. How does the mathematics performance of Richfield students compare across age levels?

Some identical items were included in the exercises at more than one age level. Of these overlap items, 32 were common to both 9 and 13 year olds, 86 were common to both 13 and 17 year olds and 15 items were common to all three age groups. Of the 32 items common to both 9 and 13 year olds,

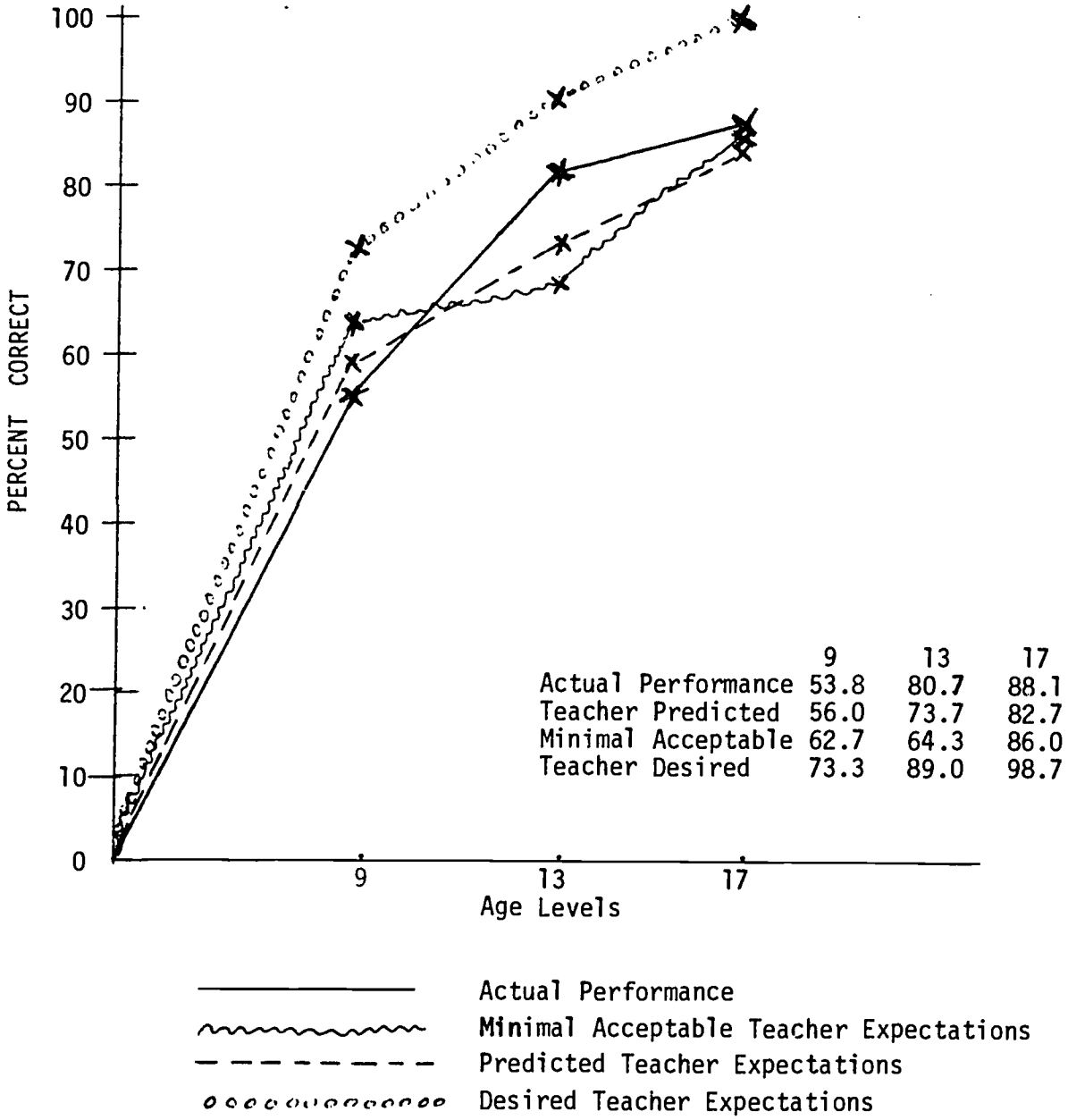
the average percent correct for 9-year-olds is 57.9% and the average percent correct for 13-year-olds is 70.9%, which is 13 percentage points gain for 13-year-olds compared to 9-year-olds. On the 86 items common to both 13-year-olds and 17-year-olds, the average percent correct for 13-year-olds is 56.4% and the average percent correct for 17-year-olds is 72.3% or 15.9% above 13-year-olds.

Since we have no standard by which to measure this data, we can only say that students do show growth on these overlap items as they progress through the Richfield schools. An interesting comparison can be made between teacher expectations for each age level as related to the actual student performance at each age level on the 15 items common to all three age levels. This is shown on Table 3 on the following page.

TABLE 3

FIFTEEN ITEMS COMMON TO ALL AGE LEVELS

Student performance compared to teacher expectations



	9	13	17
Actual Performance	53.8	80.7	88.1
Teacher Predicted	56.0	73.7	82.7
Minimal Acceptable	62.7	64.3	86.0
Teacher Desired	73.3	89.0	98.7

PERFORMANCE BY AGE GROUP

16. 9-year-old needs-strengths on comparative measure by cluster.

Richfield used the Minnesota statewide mathematics assessment instrument which was administered to all Richfield 9-year-olds and to a random sample of 9-year-old students in similar districts and to a random sample of 9-year-old students throughout the state of Minnesota. Since all data collected was analyzed by cluster, by objective, by item and by student variables, this allows Richfield to make comparisons of this data. Table 4 is a comparison by cluster.

TABLE 4

RICHFIELD NEEDS-STRENGTH	vs. SIMILAR DISTRICT	vs. STATE
C 1 : Computation	PS	SS
C 2 : Math Concepts and Processes	SS	SS
P 1 : Properties of Numbers	SS	SS
S 1 : MathematicsSymbols and Sets	SS	SS
F 1 : Introduction to Fractions	SN	SN
G 1 : Recognition of Geometric Properties	SS	SS
G 2 : Applications of Geometric Properties	SS	SS
PS 1 : Basic Problem Solving	SS	SS
PS 2: Patterns, Logic, Probability and Advanced Problem Solving	SS	SS
M 1 : Measurement	SS	SS

Summary of the cluster analysis on 9-year-olds for comparative measures.

TABLE 5

CLASSIFICATION	NUMBER OF CLUSTERS (10 TOTAL)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS (No measure)	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED		1	1
NEED		0	0
POTENTIAL NEED		0	0
ACCEPTABLE		0	0
POTENTIAL STRENGTH		1	0
STRENGTH		0	0
SIGNIFICANT STRENGTH		8	9

17. 9-year-old needs-strengths by objectives as determined for comparative measure and teacher expectations.

TABLE 6

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
I A 1	S	PS	SS
I A 2	S	SS	SS
I A 3	SN	PS	SS
I B 1	S	SS	SS
I E 2	SS	PN	A
I G 1	N	SS	SS
I H	PN	SS	SS
II A 1	PN	PS	SS
II A 2	PN	SS	SS
II A 3	S	SS	SS
II A 4	N	A	A
II B 1	N	PN	PS
II B 2	N	A	SS
II C 1	A	N	PN
II E	S	A	A
II H 1	A	S	S
II I 1	S	PS	SS
II K 1	SN	SS	SS
II L 2	SS	SS	SS
II O 1	PN	SS	SS

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
II 0 2	PN	A	PS
II 0 3	SN	A	A
II 0 5	SN	SS	SS
III A 1	N	N	SN
III A 2	PS	PS	SS
III B 1	N	SS	SS
III B 2	N	SS	SS
III C 1	PN	SS	SS
III D 1	SN	SN	SN
III E 1	SN	A	A
III E 2	SN	S	SS
III F 1	A	SS	SS
III F 2	SN	A	PS
III G 1	A	SS	SS
III I 1	N	SS	SS
III I 2	SN	S	SS
III K	SN	SS	SS
III L 1	PS	SS	SS
III L 2	A	PN	A
III L 3	SS	SS	SS
III M 1	PN	SS	SS
III N 1	SN	SS	SS

TOTAL OBJECTIVES: 66

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
III O 1	SN	SN	SN
III P 1	A	S	SS
III Q 1	S	PN	A
III Q 3	SS	SS	SS
IV A 1	SN	SS	SS
IV A 2	S	SS	SS
IV A 3	SN	SS	SS
IV B 1	PN	SS	SS
IV C 1	SN	SS	SS
IV E	A	PS	SS
IV F	SN	SS	SS
IV G	A	SS	SS
IV J 1	SN	SS	SS
IV J 2	PS	SS	SS
V A 1	SN	SN	SN
V A 2	A	SS	SS
V A 3	PN	PS	SS
V A 4	SN	S	SS
V A 6	SN	PS	SS
V A 7	A	SS	SS
V A 10	SN	PN	PN
V A 11	SN	SS	SS
V A 12	SN	SS	SS
V H 1	SN	PS	SS

Summary of the needs-strengths for objectives as determined by teacher expectation and comparative measures.

TABLE 7

CLASSIFICATION	NUMBER OF OBJECTIVES (TOTAL: 66)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	24	3	4
NEED	8	2	0
POTENTIAL NEED	9	4	2
ACCEPTABLE	10	7	7
POTENTIAL STRENGTH	3	10	3
STRENGTH	8	5	1
SIGNIFICANT STRENGTH	4	35	49

The greatest number of objectives in the criterion measure of teacher expectations are in the need classifications (forty-one objectives). The second greatest number was in the classification acceptable (ten). It appears the teachers see more needs than strengths in student math performance at the nine year old level.

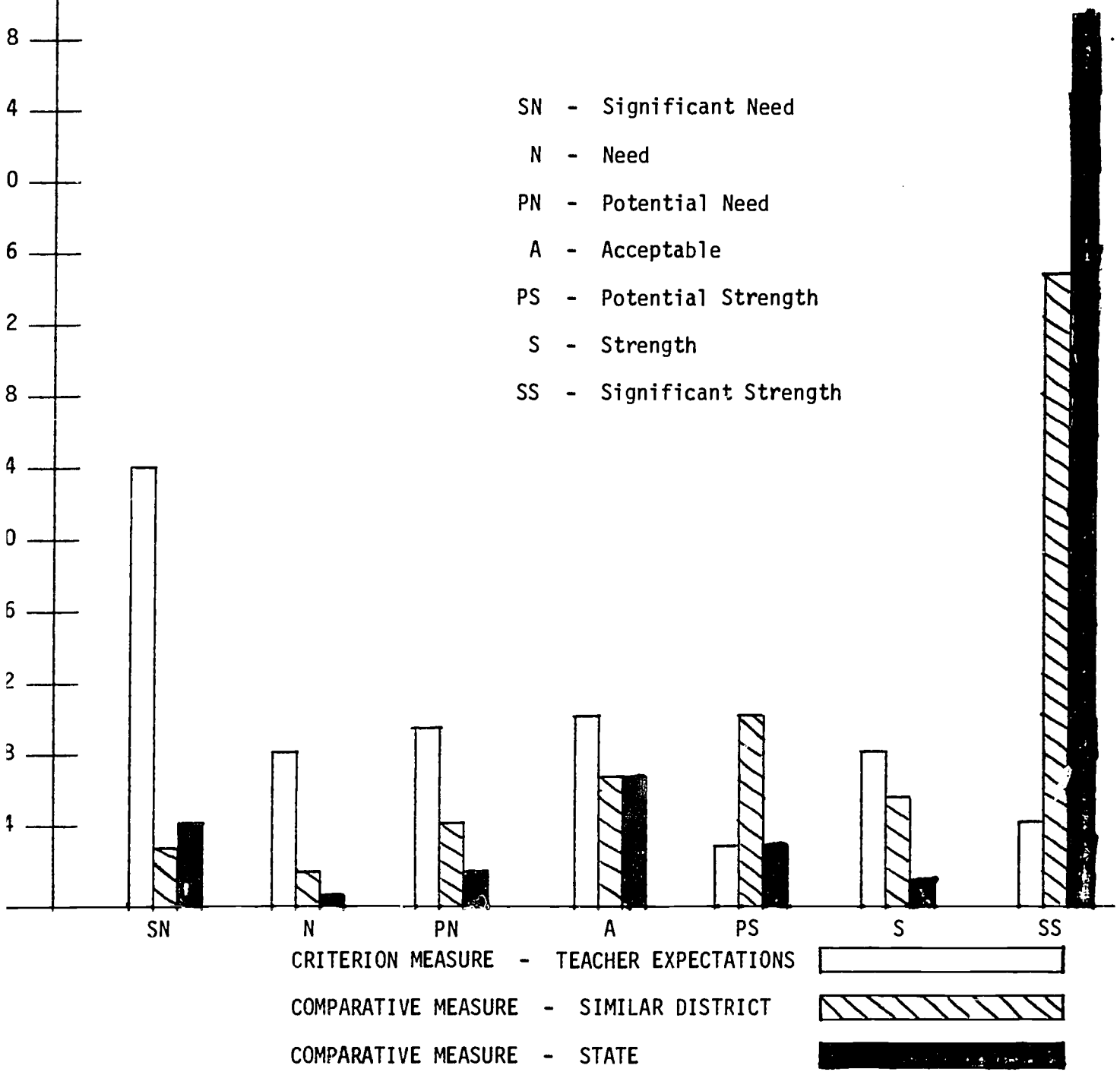
The greatest number of objectives in the comparative measure, Richfield vs. similar district are in the strength classifications (fifty objectives). A small number of objectives are in the need classifications (nine).

The greatest number of objectives in the comparative measure Richfield vs. state are in the strength classifications (fifty-three objectives). Again, there were very few objectives in the need classifications (six objectives).

Summary: It is apparent from this analysis that Richfield teachers have high expectations of their students. The criterion comparisons are subjective in nature and therefore the significance is of a judgmental nature. All comparative performance results of Richfield nine-year-olds consistently indicate that Richfield students are strong in most areas of mathematics.

Bar graph indicating the 9-year-old needs-strengths for objectives (66) as determined by criterion and comparative measures.

TABLE 8



18. Summary of Richfield 9-year-old needs-strengths for items as determined by teacher expectations and comparative measures.

TABLE 9

CLASSIFICATION	NUMBER OF ITEMS (TOTAL: 119)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	38	5	
NEED	9	2	
POTENTIAL NEED	18	11	
ACCEPTABLE	21	12	
POTENTIAL STRENGTH	4	22	
STRENGTH	13	15	
SIGNIFICANT STRENGTH	16	52	

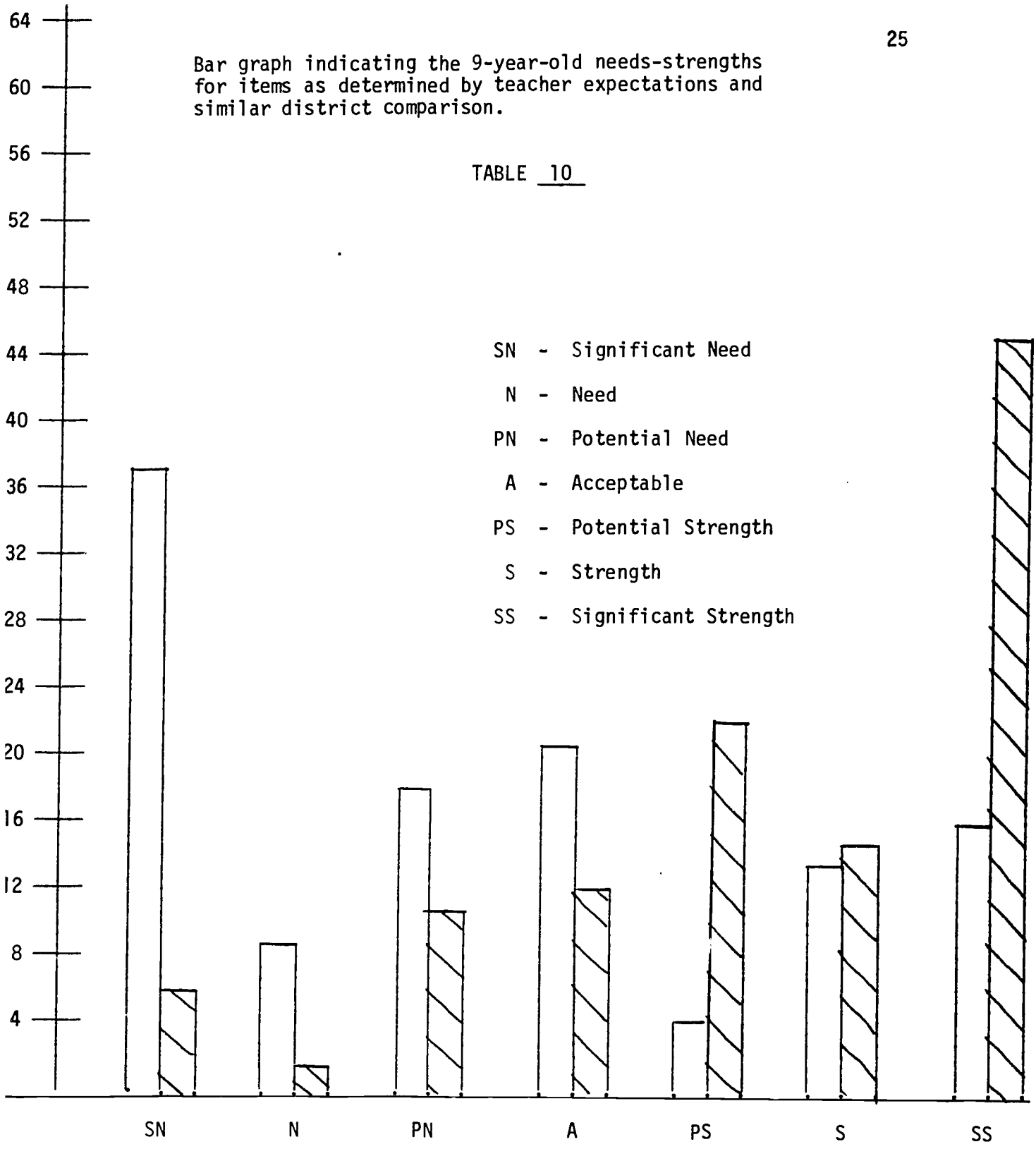
Sixty-five items for the criterion measure of teacher expectations are in the need classification (PN, N, SN), while there are thirty-three items in the strength (PS, SS, S) areas. In the acceptable classification there are twenty-one items.

Eighty-nine items for the comparative measure, Richfield vs. similar district, are in the strength classifications. There are eighteen items in the need classifications. In the acceptable classification there are twelve items.

There appears to be a large discrepency between the teachers' expectations and the actual performance of the nine-year-olds.

Bar graph indicating the 9-year-old needs-strengths for items as determined by teacher expectations and similar district comparison.

TABLE 10



19. East Junior High 13-year-old performance analysis by cluster.

East Junior High 13-year-old need-strengths for clusters by comparative measures.

TABLE 11

RICHFIELD NEEDS-STRENGTH		vs. SIMILAR DISTRICT	vs. STATE
C 1 :	Computation with Whole Numbers	A	PS
C 2 :	Concepts and Computation with Common Fractions	SS	SS
C 3:	Concepts and Computation with Decimal Fractions	SS	SS
P 1 :	Properties of Numbers	PS	SS
P 2 :	Number Expressions and Factors	SS	SS
D 1 :	Definitions of Terms and Symbols	SS	SS
G 1 :	Recognition of Geometric Properties	SS	SS
G 2 :	Applications of Geometric Properties	SS	SS
A 1 :	Algebraic Expressions	SS	SS
A 2 :	Algebraic Applications	SS	SS
M 1 :	Using Measurement Systems	SS	SS
I 1 :	Interpreting Graphs, Maps and Pictures	SS	SS
PS 1 :	Basic Problem Solving	S	SS
PS 2 :	Patterns, Logic and Advanced Problems Solving	SS	SS
MM 1 :	Metric Measurement	SS	SS

Summary of the cluster analysis for comparative measure.

TABLE 12

CLASSIFICATION	NUMBER OF CLUSTERS (TOTAL: 15)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS (No measure)	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED		0	0
NEED		0	0
POTENTIAL NEED		0	0
ACCEPTABLE		1	0
POTENTIAL STRENGTH		1	1
STRENGTH		1	0
SIGNIFICANT STRENGTH		12	14

20. East Junior High 13-year-old needs-strengths by objectives as determined for comparative measure and teacher expectations.

TABLE 13

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
I A 1	SS	PN	A
I B 2	PN	PN	PN
I B 3	S	SS	SS
I B 4	SS	A	PS
I C 1	SS	SS	SS
I C 2	SS	SS	SS
I C 3	A	SS	SS
I C 6	S	S	SS
I D 1	SS	SS	SS
I D 2	S	SS	SS
I D 3	SS	SS	SS
I E 2	S	SN	PN
I F 1	S	SN	N
I F 2	SN	A	A
I G 1	SS	S	SS
I G 2	S	SS	SS
I H 2	PS	SS	SS
II A 1	S	PS	PS
II A 2	A	SS	SS
II A 3	A	SS	SS
II A 4	PN	PS	S
II A 6	PS	SS	SS
I A 7	PS	PS	PS

BJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
II A 8	SN	A	PS
II A 9	S	SS	SS
II B 1	S	SS	SS
II B 3	SS	S	S
II D 1	SS	S	SS
II D 2	PN	S	SS
II E 1	PS	SS	SS
II F 1	SS	PN	A
II G 1	SS	PS	S
II H 2	PN	A	A
II H 3	PN	SS	SS
II J 1	SN	N	SN
II J 2	S	PS	PN
II J 4	S	S	SS
II A 1	SS	S	SS
II B 1	PS	PS	PS
II D 1	S	SS	SS
II F 1	SN	SN	SN
II G 1	S	S	S
II H 1	A	A	A
II H 2	PN	SS	SS
IV A 1	PS	SS	SS
IV A 2	S	PS	S

TOTAL OBJECTIVES: 67

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
IV A 3	SS	PN	PN
IV A 4	PS	S	SS
IV A 5	S	S	SS
IV B 1	SS	SS	SS
IV B 2	SS	SS	SS
IV C 4	SS	PS	SS
IV D 1	SS	S	S
IV E 1	PS	A	A
IV F 1	PS	PN	A
IV G 1	A	A	A
IV G 2	PS	PS	PS
IV I	A	S	S
V A 1	SS	A	PS
V B 1	SS	S	SS
V B 4	PN	PS	PS
V D 1	SS	SS	SS
V D 4	PS	PS	PS
V E 2	SS	PS	S
V F	PS	SS	SS
V G	SS	SS	SS
V H	A	A	A

Summary of East Junior High 13-year-old needs-strengths for objectives as determined by teacher expectations and comparative measures.

TABLE 14

CLASSIFICATION	NUMBER OF OBJECTIVES (TOTAL: 67)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	4	3	2
NEED	0	1	1
POTENTIAL NEED	7	5	4
ACCEPTABLE	7	8	9
POTENTIAL STRENGTH	12	12	9
STRENGTH	15	13	8
SIGNIFICANT STRENGTH	22	24	34

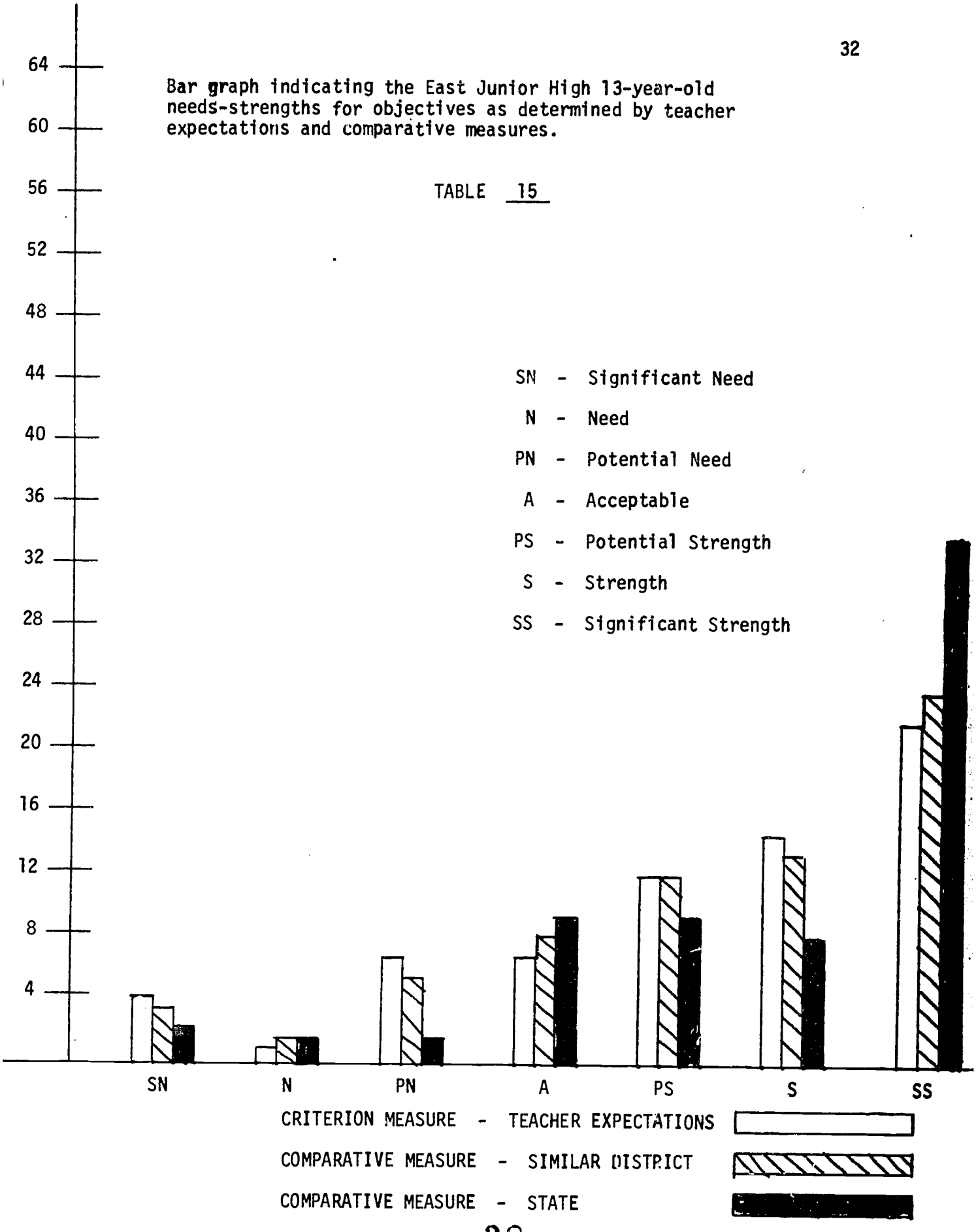
When Richfield East Junior High students are compared to students in similar districts on the sixty-seven objectives, the assessment indicates that forty-nine objectives are in the strength classifications while only nine objectives are in the need classifications. This is a ratio of better than five-to-one. Of the forty-nine above the acceptable range, there are twenty-four objectives which indicate significant strength, thirteen strengths and twelve potential strengths. Of the nine objectives which are below the acceptable range, five indicate a potential need, one indicates a need and three indicate a significant need. There are nine objectives in the acceptable range.

When Richfield East student performance is compared to Minnesota 13-year-old performance on the sixty-seven objectives, the assessment indicates that fifty-one objectives are above the acceptable range, and only seven are in the need classifications. This is a ratio of better than seven-to-one. Nine objectives are in the acceptable range.

Summary: See page 41 (West Junior High summary).

Bar graph indicating the East Junior High 13-year-old needs-strengths for objectives as determined by teacher expectations and comparative measures.

TABLE 15



21. Summary of East Junior High 13-year-old needs-strengths for items as determined by teacher expectations and similar district comparison.

TABLE 16

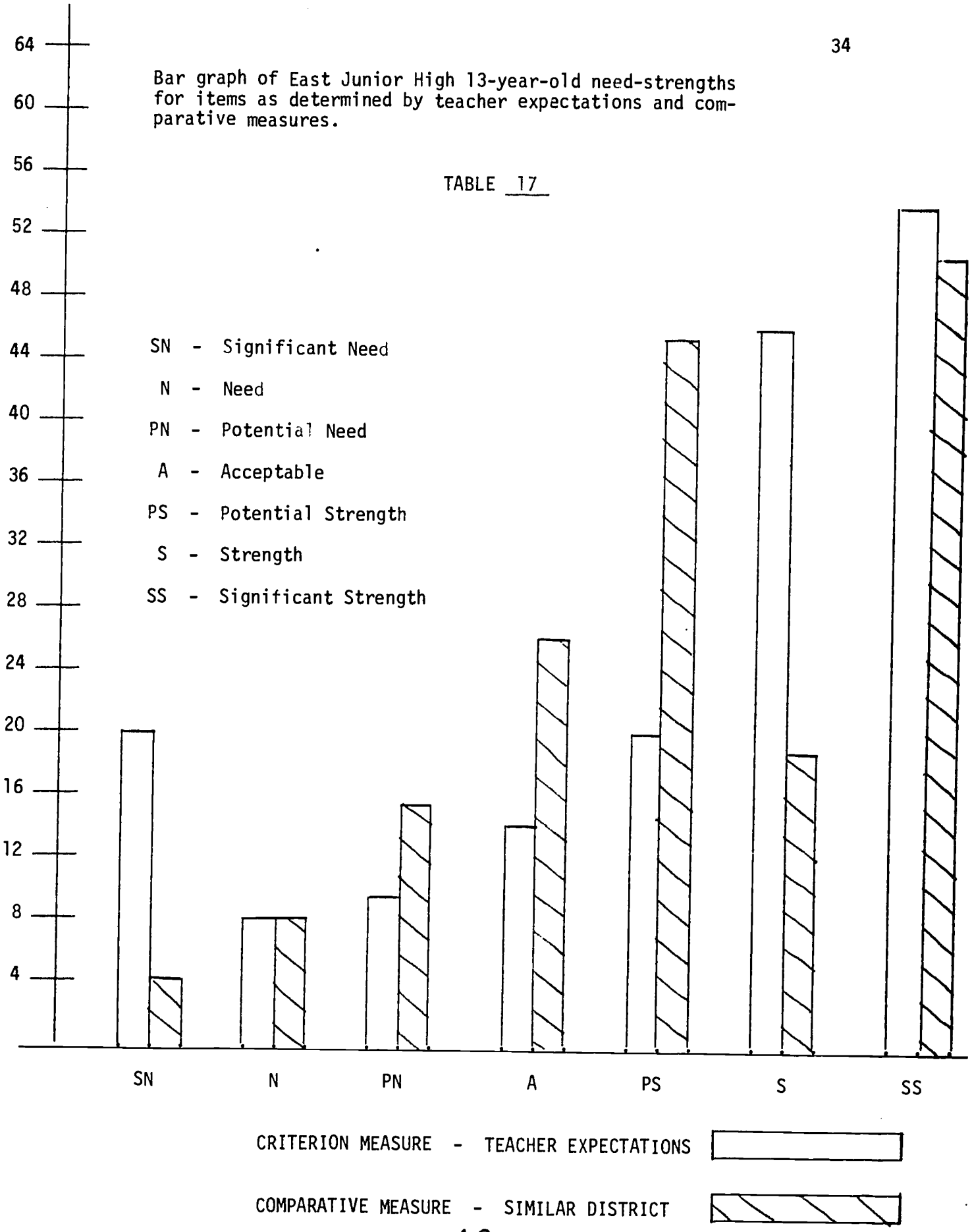
CLASSIFICATION	NUMBER OF ITEMS (TOTAL: 169)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	20	4	
NEED	8	8	
POTENTIAL NEED	9	15	
ACCEPTABLE	13	26	
POTENTIAL STRENGTH	20	45	
STRENGTH	46	19	
SIGNIFICANT STRENGTH	54	51	

When Richfield East students are compared to students in similar districts by item, the assessment indicates that one hundred fifteen items are in the strength classification and acceptable range, and twenty-seven are in the need classifications.

These results are especially significant since Minnesota suburbs outperformed the state in most areas of mathematics.

Bar graph of East Junior High 13-year-old need-strengths for items as determined by teacher expectations and comparative measures.

TABLE 17



22. Richfield East Junior High student performance compared to teacher expectations.

Teacher expectations are a very subjective standard, so the number of items which fall into each specific classification is not particularly significant. However, the objectives and the items on which the student scores are rated below the classification of acceptable probably bear closer scrutiny than those which are rated comparatively high or above the acceptable classification.

There are forty-nine objectives in the strength classifications, seven objectives in the acceptable classification and eleven are classified as needs. This data indicates that Richfield East Junior High student performance on 73% of the sixty-seven objectives are in the strength classifications and 16% are in the need classifications according to the criterion measure of teacher expectations.

When Richfield East Junior High student performance on the one hundred sixty-nine items is compared to teacher expectations, there are one hundred nineteen in the strengths classifications, thirteen as acceptable and thirty-seven in the need classifications.

When student performance is analyzed on the one hundred sixty-nine items, the data indicates that 70% of the items are rated in the strength classifications and 16% are in the need classifications according to teacher expectations standards.

23. West Junior High 13-year-old performance analysis by cluster.

West Junior High 13-year-old needs-strengths for clusters by comparative measures.

TABLE 18

RICHFIELD NEEDS-STRENGTH		vs. SIMILAR DISTRICT	vs. STATE
C 1 :	Computation with Whole Numbers	SS	SS
C 2 :	Concepts and Computation with Common Fractions	SS	SS
C 3 :	Concepts and Computation with Decimal Fractions	S	SS
P 1 :	Properties of Numbers	SS	SS
P 2 :	Number Expressions and Factors	PS	S
D 1 :	Definitions of Terms and Symbols	SS	SS
G 1 :	Recognition of Geometric Properties	SS	SS
G 2 :	Applications of Geometric Properties	SS	SS
A 1 :	Algebraic Expressions	SS	SS
A 2 :	Algebraic Applications	SS	SS
M 1 :	Using Measurement Systems	SS	SS
I 1 :	Interpreting Graphs, Maps and Pictures	SS	SS
PS 1 :	Basic Problem Solving	SS	SS
PS 2 :	Patterns, Logic and Advanced Problem Solving	SS	SS
MM 1 :	Metric Measurement	SS	SS

Summary of the cluster analysis for comparative measures.

TABLE 19

CLASSIFICATION	NUMBER OF CLUSTERS (TOTAL: 15)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS (No measure)	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED		0	0
NEED		0	0
POTENTIAL NEED		0	0
ACCEPTABLE		0	0
POTENTIAL STRENGTH		1	0
STRENGTH		1	1
SIGNIFICANT STRENGTH		13	14

24. West Junior High 13-year-old needs-strengths by objective as determined by teacher expectations and comparative measures.

TABLE 20

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
I A 1	S	PS	A
I B 2	PN	PN	A
I B 3	S	PS	A
I B 4	SS	PS	PS
I C 1	SS	S	S
I C 2	S	PS	PS
I C 3	A	PS	PS
I C 6	S	PS	PS
I D 1	PS	PS	PS
I D 2	S	S	SS
I D 3	SS	PS	S
I E 2	S	PS	PS
I F 1	S	N	PN
I F 2	A	S	SS
I G 1	SS	PS	PS
I G 2	PN	PS	S
I H 2	PS	PS	PS
II A 1	SS	PS	PS
II A 2	SN	PS	S
II A 3	N	PS	PS
II A 4	A	PN	A
II A 6	A	PS	S
II A 7	PS	S	SS

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
II A 8	N	PS	S
II A 9	N	PN	N
II B 1	A	S	S
II B 3	SS	S	S
II D 1	PS	PN	A
II D 2	SN	PN	PS
II E 1	PS	S	SS
II F 1	A	PS	S
II G 1	SS	S	A
II H 2	A	PS	A
II H 3	SN	PS	PS
II J 1	SN	N	S
II J 2	SN	S	S
II J 4	PN	PS	PS
II A 1	A	PS	PS
II B 1	A	PS	PS
II D 1	PS	PS	PS
II F 1	SN	PS	A
II G 1	PS	S	SS
II H 1	S	S	SS
II H 2	PS	S	SS
IV A 1	PS	S	S
IV A 2	SS	PS	S

TOTAL OBJECTIVES: 67

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
IV A 3	SS	S	PS
IV A 4	S	PS	S
IV A 5	PS	PS	PS
IV B 1	A	S	SS
IV B 2	S	PS	PS
IV C 4	SS	PS	S
IV D 1	S	PS	S
IV E 1	PN	PN	A
IV F 1	PS	PS	PS
IV G 1	N	PN	A
IV G 2	A	PN	A
IV I	PN	PS	PS
V A 1	A	PS	A
V B 1	S	PS	PS
V B 4	SN	PN	PS
V D 1	PS	S	SS
V D 4	PN	PN	S
V E 2	SS	PS	S
V F	A	PN	A
V G	SS	PS	S
V H	SN	PS	PN

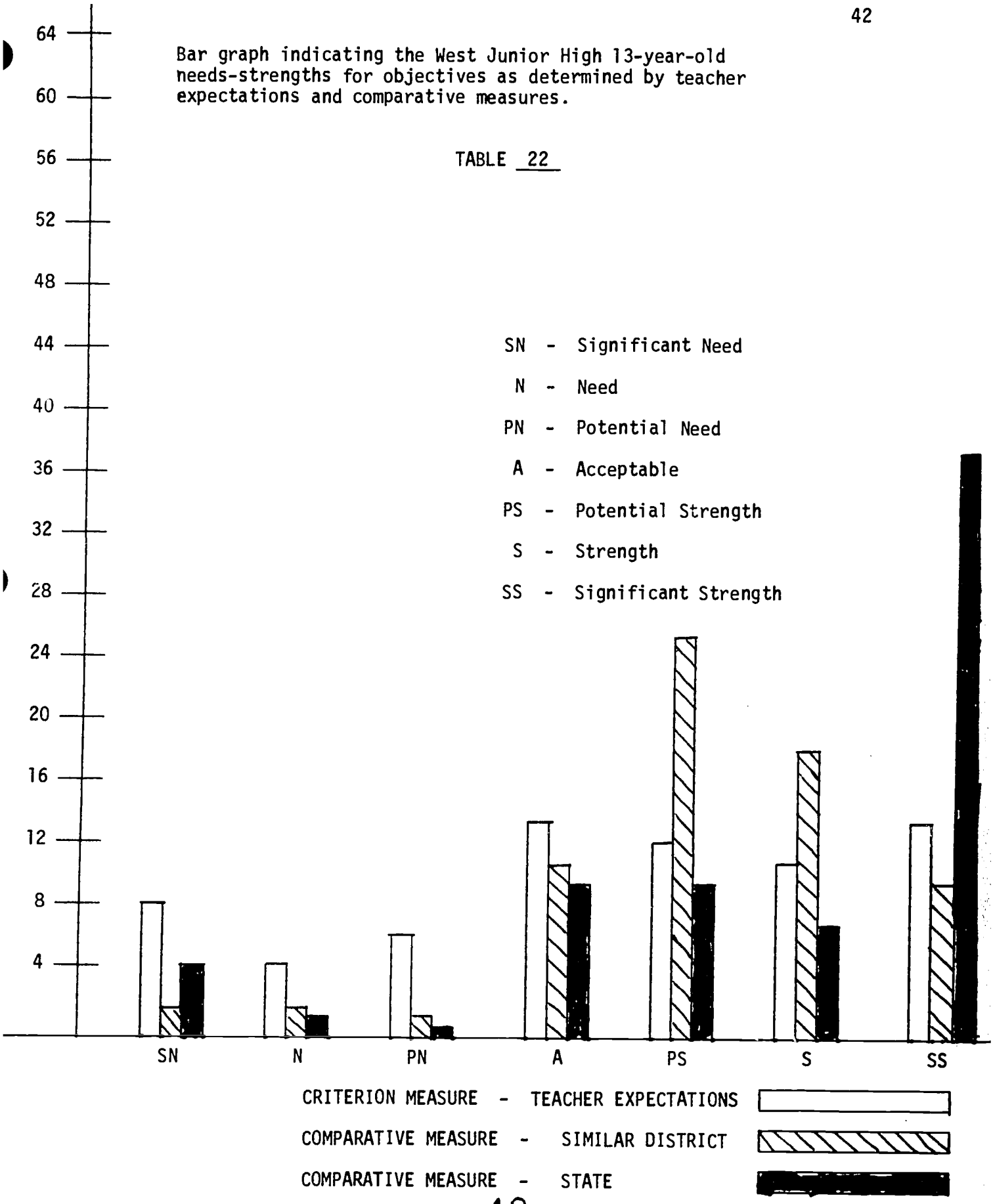
Summary of West Junior High 13-year-old needs-strengths for objectives as determined by teacher expectations and comparative measures.

TABLE 21

CLASSIFICATION	NUMBER OF OBJECTIVES (TOTALL 67)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	8	1	4
NEED	4	2	1
POTENTIAL NEED	6	1	0
ACCEPTABLE	13	11	9
POTENTIAL STRENGTH	12	25	9
STRENGTH	11	18	7
SIGNIFICANT STRENGTH	13	9	37

Bar graph indicating the West Junior High 13-year-old needs-strengths for objectives as determined by teacher expectations and comparative measures.

TABLE 22



25. Summary of West Junior High 13-year-old needs-strengths for items as determined by teacher expectations and similar district comparison.

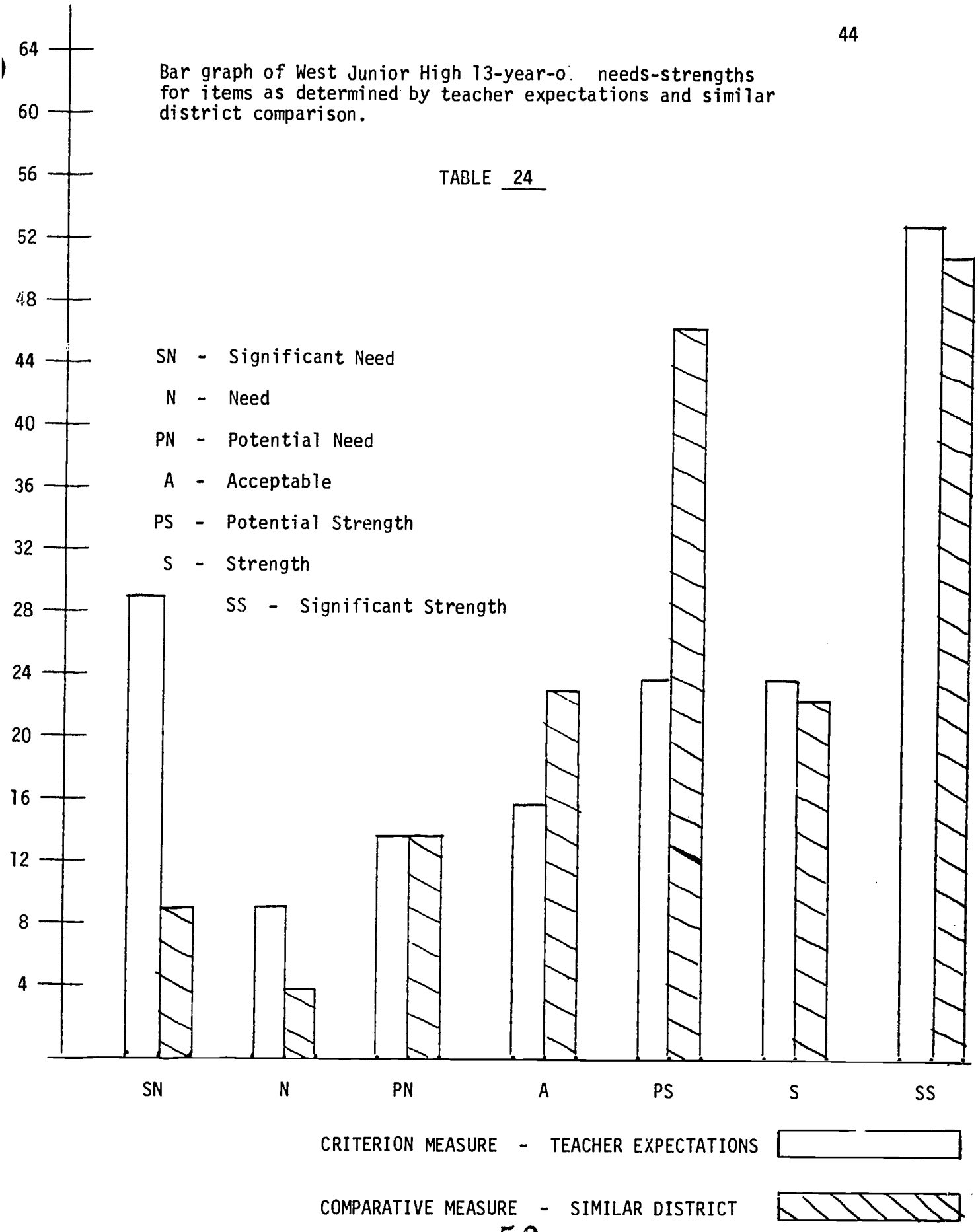
TABLE 23

CLASSIFICATION	NUMBER OF ITEMS (TOTAL: 169)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	29	9	
NEED	9	4	
POTENTIAL NEED	14	14	
ACCEPTABLE	16	23	
POTENTIAL STRENGTH	24	46	
STRENGTH	24	22	
SIGNIFICANT STRENGTH	53	51	

An analysis of the one hundred sixty-nine test items indicates that the student performance at West exceeds the acceptable range on one hundred nineteen items. Twenty-three items fell in the acceptable range and twenty-seven items are considered to show some degree of need. This comparison with similar school districts points out once again the fact that Richfield West Junior High thirteen-year-olds show considerable strength on a vast majority of the test items.

Bar graph of West Junior High 13-year-o. needs-strengths for items as determined by teacher expectations and similar district comparison.

TABLE 24



26. Richfield West Junior High student performance compared to teacher expectations.

The performance of thirteen year olds was compared to the teacher level of expectation on each item and objective. In making this comparison, seven classifications were chosen to rank and compare student results. While these classifications, with a range from significant need to significant strength, were subjectively determined by teacher evaluators, they are helpful for indirectly determining general performance levels.

Of the sixty-seven objectives, thirty-six are rated as strengths, thirteen as acceptable, and eighteen are in the need classifications. A similar comparison by item shows one hundred one items in the strength classifications with sixteen at the acceptable level and fifty-two in the need classifications.

When 13-year-old student performance at West Junior High School is compared to teacher expectations, the data indicates that 54% of the objectives are in the strength classifications and 27% of the objectives are in the need classifications. Similar analysis on the one hundred sixty-nine items indicates that 60% of the items are in strength classifications and 31% of the items are in the need classifications.

If the discrepancy between student performance and teacher expectations becomes a major factor in determining curriculum improvement, this information indicates that there are several objectives and items in mathematics at West Junior High School that need careful study.

27. Senior High School 17-year-old performance analysis by cluster.

17-year-old needs-strengths by clusters on comparative measures

TABLE 25

RICHFIELD NEEDS-STRENGTH			vs. SIMILAR DISTRICT	vs. STATE
C 1	:	Computation with Whole Numbers	SN	SN
C 2	:	Concepts and Computation with Common Fractions	A	SS
C 3	:	Concepts and Computation with Decimal Fractions	A	PS
P 1	:	Properties of Numbers	N	SS
G 1	:	Recognition of Geometric Properties	PN	PS
G 2	:	Applications of Geometric Properties	A	SS
A 1	:	Algebraic Expressions	A	SS
I 1	:	Interpreting Graphs, Maps and Pictures	PS	SS
PS 1	:	Basic Problem Solving	SS	SS
PS 2	:	Patterns, Logic and Advanced Problem Solving	PS	SS
M 1	:	Metric Measurement	A	S
SP	:	Statistics and Probability	SS	SS
S 1	:	Sets	A	SS
T 1	:	Trigonometry	A	PS

Summary of 17-year-old needs-strengths for clusters.

TABLE 26

CLASSIFICATION	NUMBER OF CLUSTERS (TOTAL: 15)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS (No measure)	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED		1	1
NEED		1	0
POTENTIAL NEED		1	0
ACCEPTABLE		7	0
POTENTIAL STRENGTH		2	3
STRENGTH		1	1
SIGNIFICANT STRENGTH		2	10

Compared to similar districts, Richfield 17-year-old students exhibited needs in three clusters, acceptable performance in seven, and strengths in five other clusters. The areas of need included "Computation with Whole Numbers", "Properties of Numbers", and "Recognition of Geometric Properties".

Richfield 17-year-olds had only one cluster falling in the need range when measured against statewide performance. All other clusters ranked as strengths. "Computation with Whole Numbers" was the only cluster ranked as a need.

28. Richfield 17-year-old needs-strengths by objective as determined by teacher expectations and comparative measures.

TABLE 27

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
I A 1	PS	A	PN
I A 2	SN	A	A
I C 3	PN	PN	S
I E 1	PS	PN	SS
I E 2	PN	SN	PN
I F 1	PS	A	PS
I F 2	A	A	A
I G 1	SS	A	S
I G 2	SN	A	PS
I I	SN	PN	A
I J	N	N	PS
I K	PS	PS	SS
I L 2	PN	PN	PS
I Q	PS	PN	PS
I R	PN	A	PS
I S	N	SN	N
II A	PN	SN	PN
II B	PN	PS	SS
II G	N	A	PS
II J 1	PN	SS	SS
II J 2	A	SS	SS
II N	PS	SS	S
II P	N	A	PS

OBJECTIVES	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
II Q	PS	A	SS
II R	S	A	PS
II S	S	SS	SS
II T 1	A	PS	SS
II T 2	PS	SS	SS
III A 1	PS	PS	SS
III A 2	N	A	PS
III B 1	PN	S	SS
III B 2	N	PS	SS
III J	N	PS	PS
III K	S	S	SS
III L	A	N	A
IV A	PN	PS	S
IV C 1	S	SS	SS
IV C 3	N	N	A
IV E	SS	PS	SS
IV F	A	PN	PS
IV H	N	SN	SN
IV L	N	SN	SN
IV M	PN	A	PS
IV R	N	PS	PS
IV U	PN	S	SS
IV V	SS	PS	SS

TOTAL OBJECTIVES: 58

OBJECTIVES	CRITERION MEASURE TEACHER EXPECTATIONS	COMPARATIVE MEASURE SIMILAR DISTRICT	COMPARATIVE MEASURE STATE
IV W	PS	SS	SS
V A	S	SS	SS
V B	PS	PS	SS
V C	S	S	SS
V D	A	S	SS
V F	A	S	SS
V H	PN	SN	A
V P 1	A	PS	PS
V P 2	A	PN	A
V P 3	PN	SN	A
V P 4	A	A	SS
V P 5	A	A	PN

Summary of Richfield 17-year-old needs-strengths for objectives as determined by teacher expectations and comparative measures.

TABLE 28

CLASSIFICATION	NUMBER OF OBJECTIVES (TOTAL: 58)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	3	7	2
NEED	11	3	1
POTENTIAL NEED	13	7	4
ACCEPTABLE	11	15	8
POTENTIAL STRENGTH	11	12	15
STRENGTH	6	6	3
SIGNIFICANT STRENGTH	3	8	25

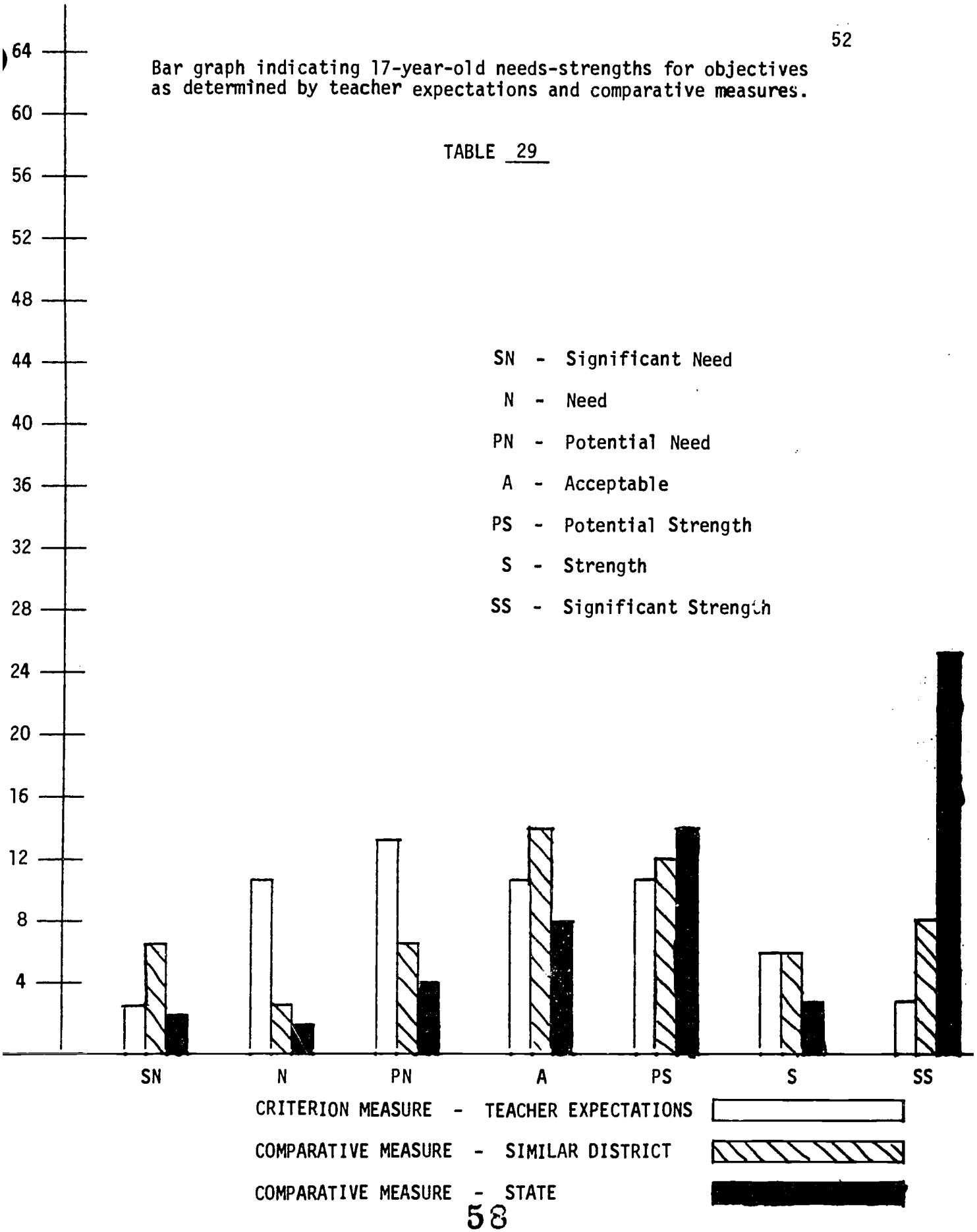
Seven classifications were established in order to measure students' performance as compared to teachers expectations. These classifications were intended to be equivalent to those used in the comparative analysis. However, one should keep in mind that teacher expectations standards are very subjective judgments. Richfield Senior High mathematics teachers rated twenty-seven objectives in the need classifications, eleven as acceptable, and twenty associated as strengths.

When measured against students of similar districts, (suburbs) Richfield 17-year-olds had seventeen objectives in the need classifications, fifteen in the acceptable range, and twenty-six are in strengths classifications. Those objectives judged as needs are mostly concentrated in the areas of "Number Properties" and "Basic Geometrical Concepts". This finding is especially favorable, because the suburban districts significantly outperformed the state and nation at the 17-year-old level.

When compared to Minnesota students statewide by objectives, Richfield 17-year-olds had only seven objectives in the need classifications, eight were acceptable, and forty=three were judged to be strengths. Objectives ranked as weaknesses were basically from the areas of "Number Properties".

Bar graph indicating 17-year-old needs-strengths for objectives as determined by teacher expectations and comparative measures.

TABLE 29



29. Summary indicating Richfield 17-year-old needs-strengths for items as determined by teacher expectations and by comparative measures.

TABLE 30

CLASSIFICATION	NUMBER OF ITEMS (TOTAL: 209)		
	CRITERION MEASURE	COMPARATIVE MEASURE	
	TEACHER EXPECTATIONS	SIMILAR DISTRICT	STATE
SIGNIFICANT NEED	15	17	
NEED	43	9	
POTENTIAL NEED	30	46	
ACCEPTABLE	38	56	
POTENTIAL STRENGTH	21	36	
STRENGTH	42	20	
SIGNIFICANT STRENGTH	20	25	

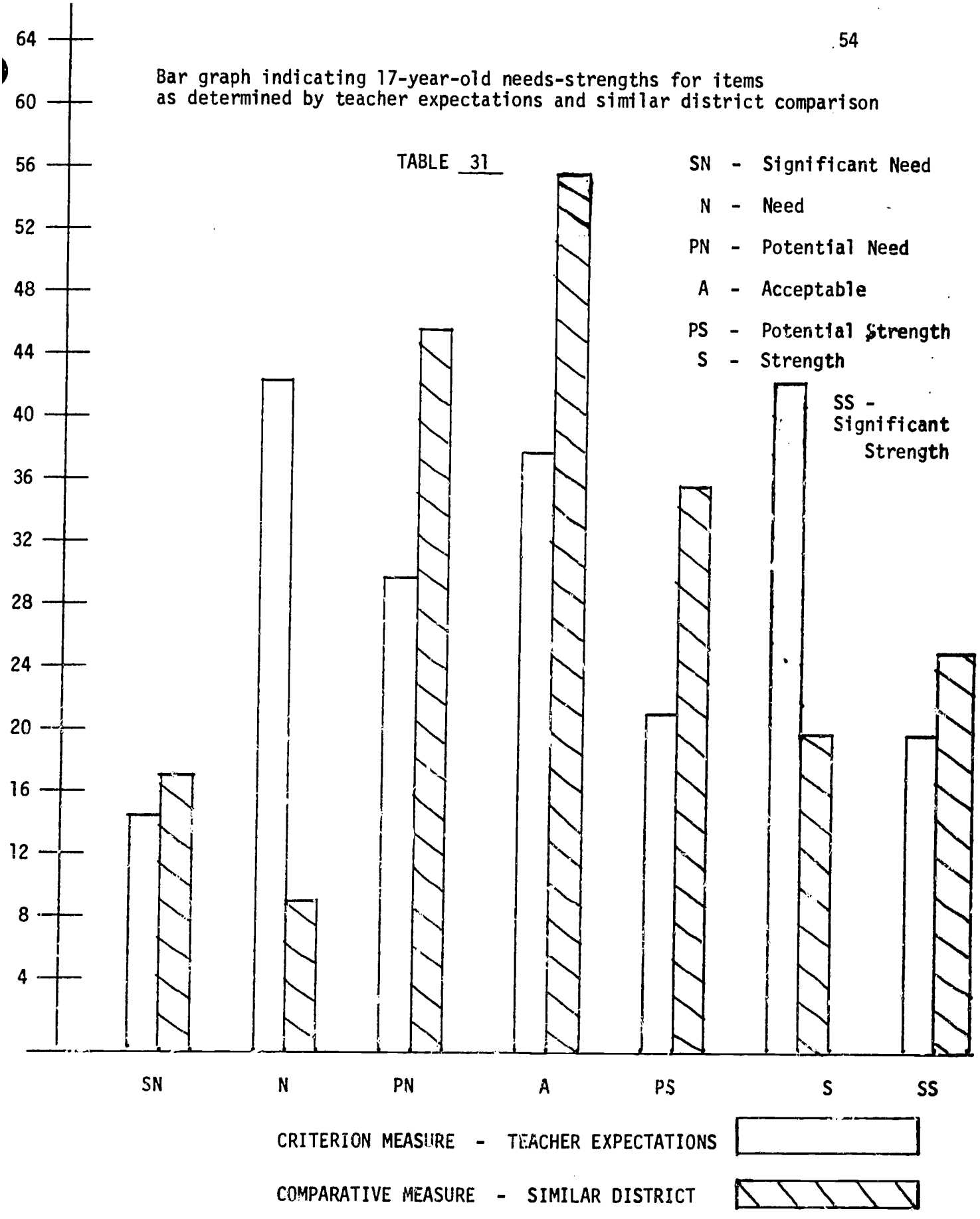
Richfield 17-year-olds, compared to students of similar district on the basis of two hundred nine test items, seventy-two items are in the needs classifications, fifty-six are acceptable and the remaining eighty-one were judged as strengths.

The analysis of needs-strengths by teacher expectations indicates that teachers rated eighty-eight items as needs, thirty-eight as acceptable, and eighty-three as strengths. Once again needs focused in the areas of "Basic Number Properties and "Geometrical Concepts". This data indicates that Richfield Senior High mathematics teachers have high student performance expectations, with student performance on 42% of the items ranking as needs, 18% as acceptable and 40% of the items indicated as strengths.

Summary: On the basis of composite results, Richfield 17-year-old students exhibited significant needs relating to "Computation with Whole Numbers. Other areas of strong need are indicated for "Number Properties" and "Basic Geometrical Concepts". Needs are in evidence across the spectrum of items tested, but with no degree of concentration in any other area. Strengths emerged in the areas of "Basic Problem Solving Techniques" and "Elementary Data Analysis". In all other areas, Richfield 17-year-old performance appears to be consistent with students from similar districts.

Bar graph indicating 17-year-old needs-strengths for items as determined by teacher expectations and similar district comparison

TABLE 31



30. Cluster analysis of Richfield students across all three age levels compared to students in similar districts and to students throughout the State of Minnesota.

Table 32 indicates that at all three age levels when Richfield students are compared to students in similar districts and to students throughout the State of Minnesota, that out of one hundred seven needs and strengths, only five clusters are in the needs classification, four of which are at the 17-year-old level, one cluster is at the 9-year-old level and none are at the 13-year-old level.

Although the comparative data is not the main thrust of this assessment, it is gratifying to know that Richfield students in mathematics do very well when compared to their peers.

We have no statistics to indicate that one age group in Richfield does significantly better than another age group in Richfield. However, it can be noted that Richfield 9-year-olds have more significant strengths when compared to Richfield 17-year-olds and that Richfield 13-year-olds have more significant strengths when compared to Richfield 17-year-olds. This strength is approximately on a two-to-one ratio in comparing the number of significant strengths by either the 9-year-olds or the 13-year-olds to 17-year-old students.

RICHFIELD NEEDS-STRENGTH vs. SIMI DISTRICT vs. STATE

		9	13E	13W	17	*	9	13E	13W	17
C 1	Computation with Whole Numbers	PS	A	SS	SN	*	SS	PS	SS	SN
C 2	Concepts and Computations with Common Fractions	*	SS	SS	A	*	*	SS	SS	SS
C 2	Mathematical Concepts and Processes	SS	*	*	*	*	SS	*	*	*
C 3	Concepts and Computations with Decimal Fractions	*	SS	S	*	*	*	SS	S	*
C 3	Concepts and Computations with Decimal Numbers	*	*	*	A	*	*	*	*	PS
S 1	Mathematical Symbols and Sets	SS	*	*	*	*	SS	*	*	*
P 1	Properties of Numbers	SS	PS	SS	N	*	SS	SS	SS	SS
P 2	Number Expressions and Factors	*	SS	PS	*	*	*	SS	S	*
D 1	Definitions of Terms and Symbols	*	SS	SS	*	*	*	SS	SS	*
F 1	Introduction to Fractions	SN	*	*	*	*	SN	*	*	*
G 1	Recognition of Geometric Properties	SS	SS	SS	PN	*	SS	SS	SS	PS
G 2	Applications of Geometric Properties	SS	SS	SS	A	*	SS	SS	SS	SS
A 1	Algebraic Expressions	*	SS	SS	A	*	*	SS	SS	SS
A 2	Algebraic Applications	*	SS	SS	*	*	*	SS	SS	*
M 1	Measurement	SS	*	*	*	*	SS	*	*	*
M 1	Using Measurement Systems	*	SS	SS	*	*	*	SS	SS	*
M 1	Measurement Systems	*	*	*	A	*	*	*	*	S
I 1	Interpreting Graphs, Maps and Pictures	*	SS	SS	*	*	*	SS	SS	*
I 1	Interpreting Graphs, Tables and Maps	*	*	*	PS	*	*	*	*	SS
PS 1	Basic Problem Solving	SS	S	SS	SS	*	SS	SS	SS	SS
PS 2	Patterns, Logic and Advanced Problem Solving	SS	SS	SS	PS	*	SS	SS	SS	SS
MM 1	Metric Measurement	*	SS	SS	*	*	*	SS	SS	*
SP	Statistics and Probability	*	*	*	A	*	*	*	*	SS
S 1	Sets	*	*	*	A	*	*	*	*	SS
T 1	Trigonometry	*	*	*	A	*	*	*	*	PS

* Not assessed at this level

TABLE 32

31. Average student performance and average teacher expectations on all items for all three age levels.

The information in Table 33 is the average percent correct for actual student performance on all items and for teacher expectations. It is the average percent at which teachers expected students to perform for the three different teacher expectations levels on all the items.

TABLE 33

9-YEAR-OLDS
AVERAGE PERFORMANCE AND AVERAGE TEACHER EXPECTATIONS

Richfield	66.2%
State	61.9%
Town and Rural	62.1%
Similar District	63.1%
Richfield Teacher Expectations	
Minimal Acceptable	74.1%
Teacher Predicted	70.9%
Teacher Desired	80.9%

13-YEAR-OLDS
AVERAGE PERFORMANCE AND AVERAGE TEACHER EXPECTATIONS

East Junior High		West Junior High	
Richfield East	61.9%	Richfield West	61.6%
State	56.6%	State	56.6%
Town and Rural	56.7%	Town and Rural	56.7%
Similar District	57.7%	Similar District	57.7%
Richfield Teacher Expectations		Richfield Teacher Expectations	
Minimal Acceptable	41.8%	Minimal Acceptable	52.1%
Teacher Predicted	55.5%	Teacher Predicted	60.9%
Teacher Desired	71.0%	Teacher Desired	79.3%

17-YEAR-OLDS
AVERAGE PERFORMANCE AND AVERAGE TEACHER EXPECTATIONS

Richfield	55.8%
State	53.0%
Town and Rural	51.6%
Similar District	55.4%
Richfield Teacher Expectations	
Minimal Acceptable	58.6%
Teacher Predicted	48.3%
Teacher Desired	79.3%

The data in Table 33 reveals all three teacher expectation levels for Richfield 9-year-old students are above the actual student performance but that student performance is above their peers throughout Minnesota. Several statements could be made relative to teacher expectations. This report previously has stated that teacher expectations are a judgmental decision. The report also indicates that Richfield teachers have high student expectations. We could raise the question of is there an appropriate relationship between teacher expectations and, if so, what is that proper relationship? This study does not answer that question.

West Junior High mathematics teachers were very close for the predicted teacher expectations as compared to actual student performance. However, West Junior High desired teacher expectations are considerably higher than East Junior High desired teacher expectations. The actual student performance at both schools is within three-tenths of one percent of being the same.

Richfield senior high mathematics teacher expectations even at the minimal level of acceptability are higher than the actual student performance. This discrepancy, according to our needs-strengths evaluation, has resulted in a number of needs which has implications for curriculum improvement and warrants careful study.

The comparative analysis for 9-year-olds and for 13-year-olds indicates that these two age groups in Richfield do better than their counterparts in similar districts, town and rural districts and better than students throughout Minnesota. Richfield 17-year-old students do better than students in Minnesota as a whole, better than students in towns and the rural areas and are comparable to students in similar districts.

STUDENT VARIABLE ANALYSIS

32. How does the mathematics performance of Richfield students compare with that of students in the nation as a whole and in the nation's suburbs?

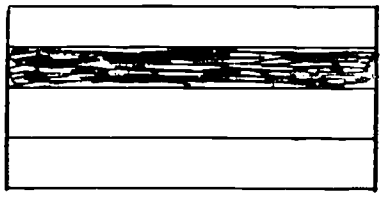
TABLE 34

RICHFIELD COMPARED TO NATIONAL PERFORMANCE

COMPARATIVE GROUP	NUMBER OF ITEMS	RICHFIELD SIGNIFICANTLY ABOVE		NO DIFFERENCE		RICHFIELD SIGNIFICANTLY BELOW	
		PERCENT	(NO. ITEMS)	PERCENT	(ITEMS)	PERCENT	(NO. ITEMS)
NATION							
9-year-olds	31	84%	(26)	13%	(4)	3%	(1)
13-year-olds	54	70%	(38)	30%	(16)	0%	(0)
17-year-olds	56	55%	(31)	43%	(24)	2%	(1)
NATIONAL SUBURBS							
9-year-olds	31	45%	(14)	52%	(16)	3%	(1)
13-year-olds	54	43%	(23)	57%	(31)	0%	(0)
17-year-olds	56	29%	(16)	66%	(37)	5%	(3)

There were only two items out of 141 items for all three age levels on which Richfield students performed below the nation's students. One of these items appeared at age nine and the other appeared at age seventeen. Both items involved work with fractions. The exercise for nine year old students asked them to identify which fractional portion of the rectangle is shaded: (9YO, Pkg. 1, Item 14A--Objective III D 1)

14. Part A. What fractional part of the figure below is shaded?



ANSWER _____

The exercise for 17-year-old students asked them to multiply fractions: (17YO, Pkg 3, Item 46--Objective II A)

46. Do the following problem:

$$\frac{1}{2} \times \frac{1}{4} =$$

ANSWER _____

33. Who did better in mathematics, Richfield boys or Richfield girls?

The performance of boys and girls at the three different age levels shows the girls outperforming the boys at age 9, a period of transition at age 13 and domination by the male group at age 17. This pattern is consistent with the state results.

At the 9-year-old level, girls exceeded the boys performance on all but one of the ten clusters. This one cluster involved Measurement Systems. The margin by which the female performance exceeded that of males was greater in Richfield than for the state as a whole. The overall performance of 9-year-olds in Richfield was higher than the state results.

The difference in the performance of boys as compared to girls is the smallest at the 13-year-old level. The girls maintain a lead in a majority of the fifteen clusters, but the boys performed better on the cluster groups related to Applications of Geometric Properties, Interpreting Graphs, and Basic Problem Solving. These results were quite consistent at both East and West Junior High schools where the 13-year-olds were tested.

The 17-year-old boys outperformed girls on all of the fifteen clusters. Not only is this a reversal of the 9-year-old results, but the difference between the total scores for the sexes is greater at the 17-year-old level than for the 9-year-olds.

Who did better in mathematics? The question is one that must be answered with the age of the student in mind.

34. How well did Richfield students in each of the three socio-economic groups perform on the mathematics assessment?

Comparison by each age group: the criterion used for determining the socio-economic status of each student was a combination of the answer to two questions: the father's and mother's education level and, (2) the occupation of the head of household.

Nine-year-olds: the performance of Richfield nine-year-olds in the high socioeconomic group was significantly above district performance levels in all ten clusters. For the middle group, the results show no clusters above, three clusters significantly below and seven clusters comparable to the results of the district. The low socioeconomic group scored significantly below in all ten clusters.

Thirteen-year-olds, East Junior High: The high SES students in the high socioeconomic group from East Junior High scored significantly higher than district levels in nine of the fifteen clusters, and at a comparable level in six of them. Results from middle socioeconomic group show no clusters of significant strength, eleven that are comparable, and four register below district level. Students from the low group showed only one cluster as a significant need with the remaining fourteen at an acceptable level.

Thirteen-year-olds, West Junior High: The performance of thirteen-year olds at West shows students from the high socioeconomic group scoring significantly above the district in ten of the fifteen clusters. Five clusters are comparable and none of them are below the district as a whole. Students from the middle socioeconomic group scored at a comparable level to the district in fourteen of the clusters with only one below. Performance from the low socioeconomic group resulted in six clusters at a significant need level, and nine are at a comparable level.

Seventeen-year-olds: Results from Richfield's seventeen-year-olds indicates that students from high socioeconomic groups score significantly higher in only two of the fifteen clusters. Thirteen are at a comparable level and none are determined to be significantly below those of the district. The middle socioeconomic group results show all fifteen clusters to be comparable to district levels. The low socioeconomic group scored below the district as a whole in eleven of the clusters and four were comparable.

Summary: In general, the students at all three age levels in the low socioeconomic group score below the Richfield district performance as a whole or are comparable to it, and those in the high socioeconomic group score at the district level or above. Those in the middle group are, in most cases, at the level of district performance.

TABLE 35

Performance Levels for each age group

Nine-Year Olds 10 Clusters	Significantly Below District Performance	Comparable to District Performance	Significantly Above District Performance
Low SES	10	0	0
Middle SES	3	7	0
High SES	0	0	10
Thirteen-Year Olds. East Jr. 15 Clusters			
Low SES	1	14	0
Middle SES	4	11	0
High SES	0	6	9
Thirteen-Year Olds West Jr. 15 Clusters			
Low SES	6	9	0
Middle SES	1	14	0
High SES	0	5	10
Seventeen-Year Olds 15 Clusters			
Low SES	11	4	0
Middle SES	0	15	0
High SES	0	13	2

Statewide results indicate that SES is strongly related to performance. While Richfield does not have as high a proportion of high SES as the similar districts, (suburbs), they outperformed the suburbs to a great extent.

35. What attempts were made to determine whether there is a relationship between mathematics performance and student feelings about mathematics?

Each student, at all age levels, was asked to describe his/her feelings about mathematics by responding to one of the following four responses: Math is my least favorite subject; Math is not included among my favorite subjects; Math is included among my favorite subjects; or Math is my most favorite subject. The results to these responses are analyzed and reported by age groups.

Nine-year-olds: The nine year old students who consider math their favorite subject performed better on this test than those who did not consider mathematics their favorite subject. The analysis of the test results by cluster indicate this performance was significantly better at the .05 level of significance for every cluster. The greatest difference (14.4 percentage points) was noted in the Computation of Whole Numbers and the least difference (2.4 percentage points) was in the cluster dealing with the Application of Geometric Concepts.

Thirteen-year-olds: The West Junior High students who indicated that mathematics was their favorite subject outperformed the students who listed mathematics as their least favored subject in every cluster. This difference was significant at the .05 level in eleven of the fifteen clusters. The greatest variation (32.5 percentage points) was noted in the [illegible]wledge of Algebraic Expressions and the least difference (2.4 percentage points) was in the cluster concerning Patterns, Logic and Advanced Problem Solving.

The cluster analysis of East Junior High students indicated a single cluster, concerning Recognition of Geometric Properties, in which the

level of achievement was slightly higher (1.4 percentage points) for the students that indicated mathematics was not their favorite subject. In thirteen of the remaining fourteen clusters however, the students indicating that mathematics was their favorite subject did significantly better at the .05 level of significance. The greatest variation (23.1 percentage points) was indicated in a cluster concerning word problem solving.

Seventeen-year-olds: Those students who indicated that mathematics was their favorite subject scored higher on every cluster at the .05 level of significance when compared to students indicating that mathematics was the least favorite subject. The least difference (11.2 percentage points) was in a cluster concerning Computation of Whole Numbers and the greatest variance (43.2 percentage points) was in Knowledge of Algebraic Expressions.

Summary: Those students who consider mathematics their favorite subject achieve significantly greater success than those who do not consider mathematics one of their favorite subjects. The degree of this success increases as the students become older in age.

36. Analysis by years in mathematics for seventeen-year-olds.

Seventeen-year-old students were asked to indicate how many years of mathematics they had taken in grades 9, 10, 11 and 12. Without exception, Richfield 17-year-olds in every category for the number of years they had taken mathematics in grades 9-12 scored higher than the average for the State of Minnesota. Not only was the performance judged to be significantly higher in each category, but the margin by which Richfield students outperformed the state average increased as the number of years in mathematics training increased.

USE OF THIS DATA FOR PROGRAM IMPROVEMENT

37. What implications does the identification of strengths and weaknesses have for the Richfield mathematics program?

It is gratifying to know that so many strengths exist in the Richfield mathematics program, but because the ultimate goal of the assessment is to improve student performance, attention should be directed toward areas in which students show needs. The next step in the assessment - consideration of the implication of the findings - is the task of Richfield Mathematics Improvement Committees. Since data was received for each elementary school and for each secondary school, the district as well as each school has an excellent opportunity, based on impirical data, to improve curriculum both at the district and individual building level.

The district has identified mathematics instructional objectives and determined strengths and needs according to these adopted objectives. It will be the task of Mathematics Curriculum Improvement Committees to study this report, analyze these needs, prioritize these needs and make recommendations to the administration for program improvement accordingly.

While it is not a function of the Richfield Mathematics Data Analysis Committees to make these recommendations for program improvement, as the members worked to analyze the mass of information collected in the assessment and to record the major findings in this report, they enthusiastically look forward to seeing mathematics instruction improved in Richfield.

APPENDIX A

MATHEMATICS GOALS AND OBJECTIVES COMMITTEE

Committee Members

Stanley DeFreeze, Senior High School
Raymond Dillon, St. Richard's School
Virgil Duneer, Sheridan School
Sister Katherine Egan, Academy of the Holy Angels
Thomas Gullickson, Sheridan School
Quentin Johnson, East Junior High School
Dennis Laingen, Project Program Director
Ivan Ludeman, Project Director
Judy McCalla, Central School
James Murphy, Lincoln Hills School
Lory Roberts, West Junior High School
Kenneth Wesloh, Curriculum Specialist

Ex Officio Committee Members

Peter Heinrich, Director of Elementary Education
Harold Rasmussen, Director of Secondary Education

APPENDIX B

MATHEMATICS TEACHER EXPECTATIONS COMMITTEES

Elementary Committee Members

Judy Andrist, Centennial School
Barbara Hawthorn, Central School
Rosamer Holi, Elliot School
Janice Kwiat, Woodlake School
Joyce Lewin, Sheridan School
Karen Markstrom, Lincoln Hills School
Jeannie Ryan, Portland School

Secondary Committee Members

Florence Doyle, East Junior High School
Robert Haaheim, East Junior High School
John Hanson, East Junior High School
Quentin Johnson, East Junior High School
Howard Klein, East Junior High School
Joe Mischel, East Junior High School
Dennis Rodning, East Junior High School
Eugene Solfelt, East Junior High School
Rupert Wright, East Junior High School

Eugene Abelson, West Junior High School
Victor Clauson, West Junior High School
John Engels, West Junior High School
Ann Koepplinger, West Junior High School
Jerry Kjorlien, West Junior High School
Gerald Mortenson, West Junior High School
Lory Roberts, West Junior High School
Lester Sorenson, West Junior High School
Leonard Stehr, West Junior High School
Thomas Stibal, West Junior High School

Hubert Hanson, Senior High School
Gary Kampf, Senior High School
Roger Leary, Senior High School
Miles Miller, Senior High School

APPENDIX C

MATHEMATICS ELEMENTARY BUILDING ANALYSIS COMMITTEES

Committee Members

Janice Kwiat, Woodlake School
Jan Mattox, Woodlake School
June Olson, Woodlake School

Rose Anderson, Sheridan School
Thomas Gullickson, Sheridan School
Carol Rydell, Sheridan School

Marilyn Erickson, Portland School
Val Myers, Portland School
Gloria Varner, Portland School

Jan Koranda, Lincoln Hills School
James Murphy, Lincoln Hills School
Maragret Wheaton, Lincoln Hills School

Karen Alstadt, Elliot School
Cadene Burdick, Elliot School
Bernice Vlahakos, Elliot School

Barbara Bollag, Central School
Jewel Lalim, Central School
John Leak, Central School

Judy Andrist, Centennial School
Nolan Bjorge, Centennial School
Margaret Fern, Centennial School

APPENDIX D

MATHEMATICS SECONDARY BUILDING ANALYSIS COMMITTEES

Committee Members

Robert Haaheim, East Junior High School
Quentin Johnson, East Junior High School
Howard Klein, East Junior High School
Joe Mischel, East Junior High School
Dennis Rodning, East Junior High School

Victor Clauson, West Junior High School
John Engels, West Junior High School
Jerry Kjorlien, West Junior High School
Gerald Mortenson, West Junior High School
Lester Sorenson, West Junior High School

Hubert Hanson, Senior High School
Gary Kampf, Senior High School
Lowell Larson, Senior High School
Roger Leary, Senior High School
Miles Miller, Senior High School

APPENDIX E

MATHEMATICS DISTRICT ELEMENTARY DATA ANALYSIS COMMITTEE

Committee Members

Nolan Bjorge, Centennial School
Virgil Duneer, Sheridan School
Dennis Laingen, Project Program Director
Ivan Ludeman, Project Director
Judy McCalla, Central School
James Murphy, Lincoln Hills School
Val Myers, Portland School
Bernice Vlahakos, Elliot School

MATHEMATICS DISTRICT EXECUTIVE DATA ANALYSIS COMMITTEE

Committee Members

John Engels, West Junior High School
Quentin Johnson, East Junior High School
Dennis Laingen, Project Program Director
Ivan Ludeman, Project Director
Miles Miller, Senior High School
Nolan Bjorge, Centennial School