DOCUMENT RESUME

ED 082 340 EA 005 453

AUTHOR Metos, Thomas H.; Lutz, Elanny T.
TITLE An Accountability Approach Using Expectancy Criteria.
PUB DATE Jun 73
NOTE 14p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Academic Achievement; *Achievement Gains; *Educational Accountability; Elementary Schools; *Evaluation; Expectation; Learning; Learning Theories; Mathematics; *Performance Criteria; Reading Achievement; Tables (Data); Teacher Evaluation
IDENTIFIERS Arizona; *Learning Expectancy; Mesa

ABSTRACT

If American schools are to be held accountable for pupil achievement, a reliable means of determining the difference between a child's actual achievement and his learning potential must be found. This study examines the utilization of composite measures of a pupil's base level of performance as effective predictors of learning expectancy. In addition to an individual student's knowledge and skills at learning commencement, the study also takes into account several important factors (such as mental age, years in school, age norms, and school history) to provide a statistically significant performance potential for each child. In this way, the approach remains sensitive to the goals of specific programs or the objectives of a particular school district. The data are also comparable across teachers, and could possibly be used as the basis for a teacher evaluation system. (Author)

AN ACCOUNTABILITY APPROACH USING EXPECTANCY CRITERIA

by

Thomas H. Metos

Elanny T. Luty

If American public schools are to be held accountable for pupil achievement, we must find a reliable means of determining the difference between the child's actual achievement and his learning potential. This study examines the utilization of composite measures of a pupil's base level of performance as effective predictors of learning expectancy. The value of such prognostication is multitudinous. For example, if one were able to determine whether sufficient discrepancy existed between a pupil's actual performance and his expected performance, diagnosis could promptly begin to determine the cause of the discrepancy in order to prescribe treatment. Ultimately, it is conceivable to envision composite learning expectancy levels serving as referents to determine, in terms of expectancy, whether sufficient learning has occured in a classroom, school, or district. Since the evaluation of performance would not be based on a norm group but rather on individual learning expectancy levels, the data becomes comparable across teachers and possibly could be used as a basis for teacher evaluation system.

Thomas H. Metos is Professor of Education, Arizona State University, Tempe, Arizona

Elanny T Luty is Associate Principal, Paradise Valley High School, Phoenix, Arizona

June

The many factors involved in contributing to a pupil's actual learning performance have made it extremely difficult to utilize measures which are relevant and objective. The problem becomes additionally complex if one attempts to determine whether a pupil is performing at his "expected" level of performance. Measures of actual learning performance, therefore, necessitate not only the measurement of achievement in its quantitative sense but also the measurement of achievement-related variables. Measurement of such variables, however, necessitates the use of multiple input factors which in some way embody these achievement-related criteria and in addition have the virtue of measureability. The findings of the authors suggests that the learning expectancy level formula exemplifies such criteria.

METHODS AND PROCEDURES

Different methods for determining a pupil's learning potential, i.e., his learning expectancy level (LEL) have been suggested. These include the following:

1. LEL 1...Kaluger and Kolson
2. LEL 2...Bond and Tinker
3. LEL 3...Harris - Expectancy Quotient
4. LEL 4...Harris - Reading Quotient
5. LEL 5...Index of Learning Potential
6. LEL 6...Durrell and Brassard

The investigators attempted to determine the validity of using learning expectancy level (LEL) criteria at the third and sixth grade levels for reading and mathematics as they relate to pupil

performance. By applying the above learning expectancy level criteria simultaneously to an individual, a single criterion measure of the highest capability of prediction could be determined. This could be evidenced by relating actual student achievement with the various learning expectancy level criteria. For the purpose of the investigation, the question became:

1) What differences exist between the proposed learning expectancy level criteria?
2) Which of the existing criteria correlate most closely with actual student achievement.

If such criteria were deemed feasible in terms of their validity, then additional reliability procedures of each criterion could be made insofar as these criteria relate toward predicting pupil performance.

Two elementary schools were selected from a population of eighteen elementary schools in the Mesa Public Schools District, Mesa, Arizona. The two schools were selected by means of random selection drawing procedures, the third and sixth grade within each school being fully tested. In this manner, the data remained in accord with cluster sampling requirements since there was a random sample of clusters, each cluster being fully tested. As such the bias-free virtue of random selection applied to the sample of larger units, viz., schools.

Pupil data used for inclusion into the various learning expectancy level formulae was collected by means of the following instruments: Metropolitan Math Subtest, Gates-MacGinitie Reading Test, Metropolitan Achievement Test, Otis-Lennon Mental

Ability Test, Harcourt's Analysis of Learning Potential, and the Durrell Reading Test.

In order to equate the diverse LEL criteria mathematically, each LEL was converted to a "z" score prior to data analysis. Treatment of the data was as follows:

1. An analysis of variance was performed in order to determine whether there existed any significant differences in pupil's reading and mathematics scores from the time they entered school to when they completed school.
2. An analysis of variance was performed in order to determine whether there existed any differences in the predictive value of the various learning expectancy level criteria.
3. A canonical correlation was performed using post reading and mathematics scores and the six learning expectancy level criteria in order to determine which LEL predictor estimate correlated most closely with final achievement in reading and mathematics.

According to Cooley and Lohnes the utilization of the canonical correlation allows an overall test of relations between sets of variables.[7] As such, it permits the sets to be combined in all possible ways to reveal maximum correlation between components. The canonical correlation was used, therefore, to test the relationship between the following two sets of variables:

LEARNING EXPECTANCY LEVEL VARIABLES - PREDICTOR CORRELATES

1. LEL 1...Kaluger and Kolson

2. LEL 2...Bond and Tinker

3. LEL 3...Harris - Expectancy Quotient

4. LEL 4...Harris - Reading Quotient

5. LEL 5...Index of Learning Potential

6. LEL 6...Durrell and Brassard

INDIVIDUAL ABILITY VARIABLES - CRITERION MEASURES

1. Mathematics

2. Reading

3. I. Q.

Kendall pointed out, through the canonical correlation method, one may reduce the relationships between the two sets of variables.[8] In this study, the canonical correlation involved multiple predictors and multiple correlations. With each pair of canonical variates maximally correlated, the canonical correlation method revealed the degree of correlation underlying the two sets i.e., the maximum correlation between linear functions of nine two-dimensional sets of variables.

FINDINGS

Table 1 presents the variance analysis used to ascertain the statistical significance of the differences among the pre-test to post-test gains. The analysis revealed a significant "F" ratio for reading at the third grade of 106.14 and at the sixth grade of 24.39. Analysis for mathematics revealed a significant "F" ratio at the third grade of 17.43, and at the sixth grade of 34.83. The results of the analysis indicated there existed significant differences from pre-test to post-test in pupil's reading and mathematics ability at both the third and sixth grade levels.

Table 2 presents the variance analysis used to ascertain the statistical significance of the differences among the six learning expectancy level criteria at the third and sixth grade levels. A significant "F" ratio of 16.95 was established for the six learning expectancy level criteria at the third grade. At the sixth grade, the "F" ratio of 3.71 was also found to be significant. The statistically significant "F" ratio revealed that there existed significant differences in the predictive values of the various learning expectancy level criteria indicating that the six LEL formulae were not equal in predictive capability.

Table 3, X^2 of Successive Latent Roots presenting the comprehensive canonical results, i.e., $R_{c.max.} = .99$, $\Lambda = .00016$ $X^2 = 3091.84$, NDF = 18, $p < .05$ indicates a significant overall relationship between the predictor correlates, i.e., the LEL's and the criterion variables, i.e., mathematics, reading and I.Q.

Table 4 presents the overall correlation matrix R_{12}. The significant correlation relating reading and an LEL were with LEL 2 (.81) and LEL 1 (.80). The correlation values of either .81 or .80 have indicated that either LEL 2 or LEL 1 may be used to predict, with statistical significance, learning expectancy in reading performance. The significant correlations between mathematics and an LEL were with LEL 1 (.80) and LEL 2 (.79). The correlation values of either .80 or .79 have indicated that either LEL 1 or LEL 2 may be used to predict, with statistical significance, learning expectancy in mathematics performance.

TABLE 1

VARIANCE ANALYSIS OF PRE-TEST TO POST-TEST GAINS

SOURCE OF VARIANCE	SS	df	MS	F
		READING-GRADE 3		
BETWEEN	184.19	1	184.19	106.14*
WITHIN	758.36	437	1.74	
TOTAL	942.54	438		
		READING-GRADE 6		
BETWEEN	129.86	1	129.86	
WITHIN	2640.97	496	5.33	
TOTAL	2770.83	497		
		MATHEMATICS-GRADE 3		
BETWEEN	763.88	1	763.88	17.43*
WITHIN	12797.93	292	43.83	
TOTAL	13561.80	293		
		MATHEMATICS-GRADE 6		
BETWEEN	83.66	1	83.66	34.83*
WITHIN	1056.96	440	2.40	
TOTAL	1140.63	441		

*p < .05

TABLE 2

VARIANCE ANALYSIS OF SIX LEL CRITERIA

SOURCE OF VARIANCE	SS	df	MS	F
		GRADE 3		
BETWEEN	9181.22	5	1836.25	16.95*
WITHIN	94225.69	870	108.31	
TOTAL	103406.91	875		
		GRADE 6		
BETWEEN	3075.43	5	615.09	3.71*
WITHIN	162306.96	978	165.96	
TOTAL	165382	983		

* $p < .05$

TABLE 3

X^2 TESTS OF SUCCESSIVE LATENT ROOTS

UNIT	ROOTS REMOVED	LARGEST ROOT REMAINING	CANONICAL R		X^2	NDF	P
GRADE 3	0	.99	.99	.000016	1687.97	18	.05
GRADE 6	0	.99	.99	.0000012	2650.53	18	.05
OVERALL	0	.99	.99	.00016	3091.84	18	.05

TABLE 4

CORRELATION MATRIX $R_{12:}$ LEL CRITERIA - PREDICTOR
AND INDIVIDUAL ABILITY MEASURES - CRITERION
OVERALL

	LEL 1	LEL 2	LEL 3	LEL 4	LEL 5	LEL 6
ATHEMATICS	.80	.79	.62	.74	.43	-.45
EADING	.80	.81	.34	.48	.42	-.36
Q.	.63	.48	.26	.66	.42	-.30

(Only significant co relations were listed)

Indicated $r < .10$ $p > .05$.

SUMMARY AND DISCUSSION

It was concluded that prediction of reading and mathematics expectancy can be statistically significant with a specific LEL criterion, viz., LEL 1 or LEL 2. Expectancy levels so derived from empirical data meet the requirement of comparability of achievement and assessment measures since the two are based virtually on the same group. It is important however, to exercise considerable caution in using the LEL since:

1. The achievement score which is compared with the "expected" value has virtually the same standard error of measurement.
2. The predicted achievement level is subject to an error of estimate since the basic correlate is less than perfect.
3. The stability of a determined learning expectancy value remains, as yet, unknown.
4. Validity is not a generalizable phenomenon and might vary from group to group. Therefore, it would need verification in each study, and certainly in each study which used as subjects a group different in some significant respect from the sample utilized in this study.

Therefore, use of the LEL as a sole criterion of expectancy without subsequent verification would be unwarranted. Appropriately used, however, learning expectancy criteria can simplify the task of the teacher in determining whether or not a student is actually working to his "expectancy".

Being held responsible for educational outcomes, i.e., being held accountable, necessitates reasonable estimates of contribution to pupil performance by individual agents in the educational process. Estimates of such contribution could be readily inferred from comparative analysis of the LEL in different classrooms, schools, and districts, i.e. whether pupils tend to fall above or below the expected performance. As such, relative evaluative criteria could be established from an analysis of results obtained by personnel working in comparable circumstances with comparable variables. Such analysis would make it possible to determine the extent to which measured teacher characteristics are significantly correlated with teacher effectiveness. Potentially, this information could have important policy implications and impact on school management, resource allocation and personnel practices.

Responsibility for educational outcomes, i.e. accountability cannot be fully realized unless we can identify the matches and mis-matches between the proposed (expected) performance level and the actual performance level. Only then can possible solution strategies be implemented. The main advantage of the approach described herein is that it takes into account individual students knowledge and skills upon commencement of learning. In addition it takes into account several important factors (such as mental age, years in school, age norms, school history) in order to provide a statistically significant performance potential for each individual child. As such, the approach remains sensitive to the goals of specific programs and/or certain objectives considered to be especially important to a given school district.

In summary, the methodology described herein has the potential of serving as an accountability system base, utilizing a quality assurance system of data that is relevant, objective and readily assessable.

FOOTNOTES

1. Kaluger, George, and C ifford J. Kolson. Reading and Learning Disabilities. Columbus: Charles E. Merrill Publishing Company 1969.

2. Bond, Guy L. and Miles A. Tinker. Reading Difficulties: Their Diagnosis and Correction. New York: Appleton-Century-Crofts, Inc., 1957.

3. Harris, Albert J. How To Increase Reading Ability. New York: David McKay Company, Inc., 1970.

4. Harris, Op. Cit.

5. Durost, W. N. Manual For Interpreting The Metropolitan Achievement Test. New York: Harcourt, Brace and World, 1962.

6. Durrell, Donald D. and Mary B. Brassard. Manual For Listening and Reading Tests. New York: Harcourt, Brace and World, 1969.

7. Cooley, William W. and Paul R. Lohnes. Multivariate Procedures For The Behavioral Sciences. New York: John Wiley and Sons, Inc., 1962.

8. Kendall, M. G. The Advanced Theory of Statistics. London - Lippincott, 1943.