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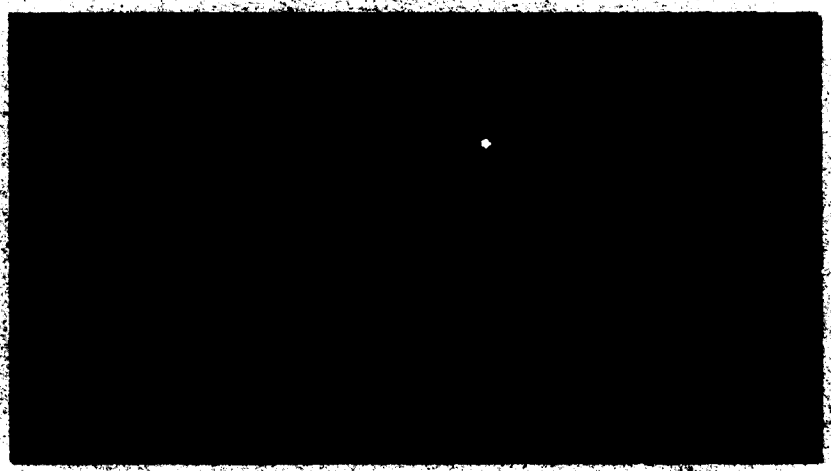
ABSTRACT

As a companion study to the primary analysis of the Management Implications of Team Teaching (MITT) study, the unitized schools in this study were examined alone for predictors of differential success in implementing the innovation. This report briefly describes how the MITT staff handled a problem in the companion study of reducing the number of predictor variables while still retaining as much information as possible about all of them. They did so by using multiple linear regression to combine conceptually related variables into clusters or blocks. Once the researchers had identified a group of variables that logically comprised a cluster, they regressed the most logical dependent variable in the group (if that were possible to determine) into the others. For each school, they multiplied the resulting raw score regression weights times the obtained score on their respective variables to produce a predicted dependent variable score; conceptually, such a predicted score reflects all the information shared among the variables in the block. (Author/JM)

project MITT



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BLOCKING PREDICTOR VARIABLES IN THE COMPANION STUDY: APPROACHES TO DATA ANALYSIS IN PROJECT MITT

by

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Introduction

As a Companion Study to the primary analyses of the MITT data (Management Implications of Team Teaching), we examined the unitized schools alone for predictors of differential success in implementing the innovation. Using preunitization and mid-implementation data, we hoped to predict differential status among the schools on two key outcome variables of the study — instructional interdependence among the teachers and collegial decision-making by teachers; respectively, these variables reflect significant work system and managerial system characteristics affected by the switch to unit organization. Details of the nature of the Companion Study and of these dependent variables can be found elsewhere in Packard et. al. (1976) and Jovick (1978). This report briefly describes how the MITT staff handled a problem in the Companion Study of reducing the number of predictor variables while still retaining as much information as possible about all of them.

The MITT Project

The MITT Project studied a fundamental change in the organization of the instructional staff of the American elementary school generally referred to as team teaching or team organization, a plan according to which the school's instructional program would be planned and carried out by small, closely-knit work groups of faculty personnel rather than by individual teachers atomistically dispersed in their separate classrooms. While the plan's rationale ordinarily rested on its efficacy for student learning, theoretical reasoning as well as empirical evidence suggested that such a reorganization could have profound implications for the locus of control over educational decisions, the structure of social relations of the faculty, the sense of fulfillment in work of individuals, and other "side-effects" of great significance to school administration.

MITT had collected data concerning the governance and work structure in 29 elementary schools, 16 of which implemented such a multiunit form of organization among the teaching staff in the Fall of 1974. To strengthen our confidence in inferences about the effects of adopting the multiunit organization, data collections occurred in the Spring of 1974, when units had not yet been formed, and every 6 months thereafter for two years. Thirteen of the schools adopted no such innovative structural change over the length of the study and served as controls matched, wherever possible, by district to the unitized schools (Packard et. al., 1976).

The Companion Study Analysis

Because the conceptual and empirical foundation of the Companion Study variables focused upon the prediction of differential implementation success by schools, we intentionally limited the investigation to a school-level analysis. Some of the variables reflect obvious and relatively enduring school characteristics such as the number of teachers, number of grades, characteristics of the principal, and teacher turnover rate. Other variables reflect perceptions and dispositions of teachers about the implementation process itself; for these we collected data from a random sample of teachers in each school and computed aggregated mean school scores to represent the general perceptual and attitudinal characteristics of the faculty.

Our general strategy for longitudinal analysis was multiple linear regression. The approach relates the variation of a dependent at one point in time to the status of the same and/or other variables at previous points in time. The regression procedure we selected is called hierarchical regression analysis and more details on its use can be found in Jovick (1978) which describes considerations of longitudinal analyses in MITT.

Because the study focused on unitized schools, we had a sample of 15 schools with which to carry out the analysis. (Of the original 16, one provided us no data on instructional interdependence.) This meant we could employ no more than two independent variables in any single analysis. That is, when the regressions did not test a model that

explicitly excluded the autocorrelation of the dependent variable with a previous wave, we usually included it in order to examine the contribution of the predictor having controlled for the through-time stability in the dependent variable. This left room for only a single predictor variable in any one equation however.

Reducing the Number of Variables

These constraints demanded we reduce the number of variables to be used in the analyses but to preserve as much information as we could about all the predictors. In addition, because the variety of variables described different but related aspects of the same property, strategy, perception, or disposition, we realized a parsimonious explanation of the findings would be difficult without some means of trimming the redundancy.

We selected multiple linear regression as the procedure for combining conceptually related variables into clusters or blocks. Once we had identified a group of variables that logically comprised a cluster, we regressed usually the most logical dependent variable in the group (if that were possible to determine) onto the others. For each school, we multiplied the resulting raw score regression weights times the obtained score on their respective variables to produce a predicted dependent variable score; conceptually, such a predicted score reflects all the information shared among the variables in the block.

An intermediate MITT research report (Packard et. al., 1976) had presented some preliminary groupings of many predictor variables. However, based upon perspectives from studies of planned and emergent change in schools, we developed a more systematic schema which postulated more definitive clusters of variables and cast them in a causal framework leading to ultimate impact on the indices of differential implementation success -- instructional interdependence and collegial decision-making.

Not all variables in the schema were of the same type; some described immutable characteristics, others described staff and principal characteristics, and yet others described staff perceptions and dispositions. At times, this fact meant we had to adapt the regression procedure to these differing natures of the variables comprising clusters.

An index called Participatory Decision Mode represents a typical blocking variable. Several pre-unitization (T1) predictor variables characterized different aspects of how the decision to install units in the school had been determined. Their intercorrelations indicated they hung together quite well and rather clearly tapped whether teachers had a "say" in the decision to adopt the MUS/IGE innovation or whether the decision were made with little or none of their input.

The relevant variables included the Locus of the Project Decision (specifically, whether the teachers had an opportunity to express approval of the decision), Decision Mode (specifically, whether the decision was reached by formal vote or consensus), Teachers' consent (the degree to which teachers' opinions about the innovation were taken into account in the decision process), and the Manner of Teacher Involvement in the project (specifically whether they wanted to be involved vs.

whether they were not involved or had no choice). We blocked these variables using data from all 16 unitized schools by regressing Locus of Project Decision scores on the three. With the obtained raw-score regression coefficients we then computed predicted Locus of Project Decision scores which characterized this block of variables.

Work on other blocked variables took a somewhat different course. For example, the MITT schools, unitized and nonunitized, differed widely in the number of specialists, special subject teachers, and aides on their staffs; these frequencies we decided to combine in a blocked variable called Munificence of Extra Staffing. Generally, the values of these variables remained constant through time although our data were not strong (often missing altogether) after T2.

After experimenting with a variety of methods of combining the data, we decided the easiest route would be to sum the values for the three variables for both at T1 and T2 to obtain Munificence totals at each of these waves. We then calculated estimated Munificence scores for each school based upon a regression of the T2 total on the T1 total over all 29 schools. (Where missing data occurred at T2, we assigned schools their T1 values.)

The procedure for this block variable deviated from the more typical one in three respects: (1) Our initial procedure was to merely sum scores rather than choose one of the variables as a dependent variable to be regressed on the other two. (2) The regression analysis estimated the relationship between the same summed variable at two different points in time rather than among the three predictors at one point in time.

(3) Since we had these data for both unitized and nonunitized schools, the regression employed all 29 schools.

Sometimes, we even disassembled clusters we had created earlier, usually on the basis of more refined conceptualizations of the variables themselves and of their relationships to each other and to the outcome variables. For example, we had created a blocked variable called Teacher Enthusiasm for the Innovation from four predictor variables: Teacher Support for the Innovation, Perceived Difficulty of Role Change, Satisfaction with the Decision Process Used in Adopting the Innovation, and Perceived Cost-Benefits of the Innovation. Further thought led us to retain Teacher Support and Satisfaction with the Adoption Decision Process as unblocked predictors since they each related differently to high degrees of instructional interdependence and, being attitudes, were both conceptually different from the other two predictors. Perceived Role Difficulty and Cost-Benefits each entailed different types of judgment about what the innovative process would require generally in effort, time, and money. These two we kept separate and, moreover, replaced Perceived Role Difficulty by a blocked variable which reflected Perceived Amount and Difficulty of Role Change.

The actual process of blocking variables did not follow as straightforward a course as decribed here. Although an explanatory model guided our initial composition of clusters, we formed many of the blocks after a great deal of exploratory correlational analyses coupled with more in-depth conceptualization. At one point we abandoned the schema en-

tirely and ran a large number of variables in a discriminant function analysis to find the major variables accounting for the difference between successful vs. unsuccessful schools. (In related analyses we had defined successful schools as those being relatively high at T5 on both instructional interdependence and collegial decision making and unsucessful schools as those relatively low on both of these variables.)

Although the discriminant analysis received much of our attention, it merited little of our credence. Many of the coefficients associated with the variables in the resulting clusters did not make conceptual sense and often contradicted conclusions drawn from zero-order correlations between predictors and outcome variables and from raw school scores. Perhaps because of the small n, the discriminant procedure had been analyzing meaningless residual variances.

Once we had finalized the blocks, the regression analyses related them to one another, to separate unblocked predictors, and to the outcome variables. Reports of some of this work can be found in Packard et. al., (1978) and Packard and Jovick (1978).

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