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The Effect of SocioContextual Variables on Child Achievement

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A study was conducted to assess the relationship of child achievement to teachers' reports of salient forces impinging upon their classrooms. The Environmental Forces Inventory was used to measure the strength and direction (positive/negative) of influence for a given set of social contextual forces, such as: school administration, environmental conditions, support staff and parents. Factors based on ratings of 26 teachers were correlated with achievement scores of 441 third grade children. In the 26 classrooms the relationship between the administrative and social context of the teacher's workspace and classroom learning was found to be both practically and statistically significant.

Much has been written of the failure of schools to teach basic skills and to offer children meaningful learning environments. The "failure of schools" hypothesis is buttressed by reports that more variation in child achievement test scores is explained by what the child brings to the school than by what the school brings to the child (1). Such conclusions may be premature as long as neither the nature and quality of the instructional process nor the critical contextual variables that directly affect the instructional process have been adequately examined.

In their work over the last seven years with

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teachers and school personnel in Project Follow Through, the authors have found that teachers, staff developers and developers of educational programs consistently indicate a number of work-contextual variables as critical for classroom functioning: administrative support, inservice training, teacher-support staff in the classroom, the relationship with parents and the availability of teaching materials (2, 3). This variable set reflects the social-psychological field of the teacher in carrying out day-to-day teaching activities.

Lewin referred to such variables as a way of understanding behavior in relation to the individual's environment (4). More recently, Bronfenbrenner (5) has drawn upon the same theoretical background to formulate his concept of "ecological validity" for education and educational research.

> *Whether and how people learn in educational settings is a function of sets of forces or systems at two levels: a) the first comprises the relations between the characteristics of the learner and his or her surroundings... b) the second encompasses the relations and interconnections that exist between these environments.*

Ecologically valid research cannot be confined only to events occurring within a setting but also must consider the relations obtaining between home, school, peer groups and the working environment. To the extent that contextual variables support the teacher, a positive, facilitating learning atmosphere can occur. To the extent that they act negatively, they may wreak havoc on the teacher's activities and the learning process. But, as yet, little is known of how much and in what ways specific contextual variables affect the teacher and the child (6).

The purpose of this study was to determine the extent to which socio-contextual variables acting on the teacher and the classroom correlate with measures of academic achievement in third grade children.

METHOD

Measures

The Environmental Forces Inventory (EFI). Since
1968, 22 program sponsors in Project Follow Through
have been implementing a variety of innovative educa-
tional models in schools throughout the country. In
the process of implementing educational change, forces
salient to program delivery can be identified. The
staff of the Responsive Education Program at Far West
Laboratory have identified the following forces that
influence teacher morale and classroom dynamics:

1. *School Principal*
2. *Central Office Administration*
3. *Other teachers in the school*
4. *Parents of the children in the class*
5. *Curriculum prescribed by the district*
6. *Testing programs*
7. *Board of Education*
8. *Physical facilities of the classroom*
9. *Social environment of the community*

Another force was introduced to assess the teacher's
own relationship to other forces and to get a sense
of her locus of control.

10. *You, Yourself*

In addition, three program components were of par-
ticular relevance of the Follow Through implementation
of the Responsive Education Program, the focal educa-
tional model in this study.

11. *Program Director*--coordinator of the Follow
    Through program within the district, respon-
    sible for administration, community organiza-
    tion and policy matters

12. *Program Advisor*--delivers the program to the
    classroom with inservice training and in-
    class assistance, with each advisor responsi-
    ble for about ten classrooms

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13. *Teaching Assistant*--a full-time, paid adult assigned to the classroom and engaged in teaching activities

The teacher responding to the EFI is asked to evaluate the set of 13 forces by carrying out three successive tasks:

Task A. Each force is rated on a scale of 0 to 9 according to its strength or importance in influencing the teacher as she works to implement the particular educational program for which she was trained; a rating of 0 indicates the force has no influence, a rating of 9 indicates a strong influence of either positive or negative effect.

Task B. A total of 100 points is distributed among the 13 forces, in direct proportion to their amount of influence. Any pattern of assignments is permissable; for instance, the respondent may choose to allocate all 100 points to just one or two of them.

Task C. Each force is rated on a scale of 1 to 9 according to its positive/negative effect on teaching; a rating of 1 indicates a strong negative influence, and a rating of 9 indicates a strong positive influence.

The EFI has undergone extensive field testing, validation and revision since 1971 (7, 8). These studies indicated that teachers understood and accepted the task of completing the instrument, as evidenced by their ability and willingness to respond. Concurrent validity for Task C was demonstrated with reference to the Purdue Teacher Opinionaire, an older, previously established instrument that was administered concurrently. Content validity and to some extent predictive validity were supported by studies of response patterns: ratings assigned were primarily related to the external objective factors in the school/work settings, as opposed to individual characteristics of the respondents, such as professional role (teacher vs. teacher assistant).

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In addition, for pairs of respondents, the closer their positions within the field of forces, along field-relevant dimensions of either geographical-or-ganizational distance of work-role category, the greater the similarity in the EFI patterns generated by them. For example, teachers in the same school had more similar ratings than teachers in different schools; teachers in different schools in the same school district had more similar ratings than teachers in different school districts; and teachers in the same school had ratings more consistent with other teachers in the school than with teaching assistants. In another test of the technique, supervisory district personnel could match individual schools to teacher-generated force field patterns with a level of accu-racy significantly above chance and the accuracy in matching was markedly better when it was done by per-sonnel functionally closer to the classroom. In two analyses (8) it was found that the size of reliability (stability) correlation coefficients for the patterns of EFI tasks increased with the size of the organiza-tional unit: over a one-year interval the averages over three tasks were: .62 for individuals; .65 for classrooms (teacher-teaching assistants dyads); .82 for schools; and .93 for districts.

Dependent variables. Achievement test scores were collected from children in a national sample of third grade classrooms by Stanford Research Institute (SRI), the national data collection contractor for Follow Through. The measures included in this study were:

- --The Metropolitan Achievement Tests, Elementary Level battery--a well-known standardized achievement battery which includes six tests: Word Knowledge, Language, Spelling, Math Com-putation, Math Concepts and Math Problems.

- --The Raven's Progressive Matrices--matrix completion and matrix extension problems which assess non-verbal cognitive development. This problem-solving test has demonstrated low mod-erate correlations with achievement measures.

Subjects. The 441 children tested by SRI were enrolled in 26 Follow Through classrooms in 13 communities implementing the Responsive Education Program (9). Approximately 60% of these children were from families with an income below the O.E.O. poverty index. Forty-five percent of the children were Anglo, 41% are Black, 11% Chicano, 2% Native American and 1% are Asian. The communities varied in geographic location, size and demographic composition--from Lebanon, New Hampshire to Buffalo, New York to Fresno, California. Teachers in those 26 classrooms completed the EFI and, to insure confidentiality, returned completed instruments to the Far West Laboratory.

RESULTS

Data Reduction

In a preliminary phase of the present study, EFI scores on the Task A question from 44 teachers were factor analyzed and rotated to a Varimax solution. The result of this variable-reduction procedure suggested the factor structure which appears in Table 1. For comparison, the factor structure based on a larger sample of 297 teachers who completed the EFI a year earlier is also included in Table 1.

The results of the factor analysis are structurally very similar across the two samples and conceptually coherent. Clearly, Factors I and II are relatively consistent across the two samples. Factor III (*Parents* and *Environmental Conditions*) for the cross-validation sample seems to be a combination of analytic sample factors III and IV. The *You, Yourself* force loads uniquely for the analytic sample, but is part of Factor IV in the cross-validation sample. The cross-validation factor IV combines the forces directly related to classroom teaching, viz. the *principal*, the *teacher* and the *teaching assistant*.

Using the analytic clusters we obtained five scores by computing the mean value for the Task A items of each cluster. Similarly, we computed five

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Table 1.
FACTOR STRUCTURES FOR THE EDUCATIONAL FORCES INVENTORY

Factors	Analytic Sample, N=44		Cross Validation Sample, N=297	
	Loadings	(% Var.)	Loadings	(% Var.)
Factor I	Educational Administration		School District Administration	
	.62 Principal		.82 Central Office	
	.80 Central Office		.51 District Curriculum	
	.79 Board of Education		.44 Testing Programs	
			.77 Board of Education	
		(28.9)		(32.1)
Factor II	Teaching and Support Staff		Local FT Program Staff	
	.63 Other teachers in school		.76 Follow Through Director	
	.53 Follow Through Director		.63 Program Advisor	
	.53 Program Advisor (trainer)		(teacher trainer)	
	.69 Teaching Assistants			
		(13.7)		(11.9)
Factor III	Parents		Parents & Environmental Conditions	
	.77 Parents of children		.57 Parents of children in class	
	in the class		.66 Soc. Environ. of Community	
			.31 Phy. Environ. of Classroom	
		(11.3)		(7.8)
Factor IV	Environmental Conditions		Teaching Staff	
	.64 Soc. Environ. of community		.55 Principal	
	.75 Phy. Environ. of classroom		.41 Teacher's Evaluation of Self	
			.33 Teaching Assistants	
		(10.9)		(4.9)
Factor V	You, Yourself		(no meaningful factor)	
	.73 Teacher's Evaluation of Self			
		(9.6)		

Cumulative explained variance   (74.5)   (56.7)

mean scores for the Task C ratings on the respective factors. The Task C scores (that is, the perceived direction or valences of the forces) were then re-coded from the "0 to 9" scale to a "-5 to +5" scale.

Finally, to streamline the number of predictor variables, the five scores used in the current study were obtained by multiplying the Task A scores (importance) by the Task C scores (positive-negative valence). Thus, for example, a high positive score on the *Environmental Conditions* factor (IV), indicates a teacher's report that this factor exerts a strong, favorable impact on teaching, while a high negative score indicates a teacher's perception of a strong, unfavorable influence.

Primary Analysis

The primary analysis for this study used the five scores described above as predictors in a regression model of the child test scores. Seven regression equations were set up, one for each of the six Metropolitan subtests and one for the Ravens. In the equation a test score was regressed on the set of five scores derived from the factors reported in Table 1. In each regression the following covariates were entered prior to the predictors: mother's education; family size; father's occupation. The relationship of contextual forces to child tests is thus expressed in the regression coefficients of the five forces in each of the seven regression equations. The standardized regression coefficients for each of the five factors and the three covariates are listed for each of the test scores in Table 2. We interpret these coefficients to mean that each standard deviation unit of change in the factor score is accompanied by the fraction of standard deviation change in the outcome test score expressed by the coefficient when the effects of other variables in the equation are held constant. The standardized regression coefficients in Table 2 allow a comparison of the relative salience of a predictor across different outcome domains. Coefficients significant beyond the .05 level of confidence are

TABLE 2.   STANDARDIZED REGRESSION COEFFICIENTS FOR
CONTEXTUAL FORCES FACTORS ON SEVEN CHILD TESTS.

	METROPOLITAN ACHIEVEMENT TEST						
	Word Kno.	Lang.	Spell	Math Comp.	Math Concepts	Math Prob.	Ravens Matrix
COVARIATES							
Mother's Education	(.17)*	(.23)	(.22)	(.13)	(.19)	(.21)	(.19)
Family Size	.05	.03	.03	-.01	(.07)	.06	.06
Father's Occupation	.07	.07	.00	-.04	.04	(.10)	.04
R (covariates)	.32	.38	.32	.15	.32	.39	.24
R² (% var. acc. for)	10%	15%	10%	02%	10%	15%	06%
PREDICTORS/FACTORS							
School Administration	(.21)	(.22)	(.23)	.09	(.27)	(.26)	(.19)
Teaching and Support Staff Other Teachers Teaching Asst. F.T. Director	(-.12)	-.07	-.02	.05	-.03	-.07	.01
Parents parents of children in classroom	.04	.04	.01	-.09	-.04	.01	(-.20)
Environmental Conditions Physical Facilities of classroom Social Environment of Community	(-.41)	(-.42)	(-.37)	(-.20)	(-.31)	(-.43)	-.00
You, Yourself Teacher's rating of self	(.44)	(.43)	(.37)	.08	(.29)	(.43)	-.02
R (covariates and predictors)	.58	.65	.57	.27	.52	.66	.34
R² (% var. acc. for)	33%	42%	32%	07%	27%	43%	11%
% total variance accounted for by EFI Predictor Factors	23%	27%	22%	05%	17%	28%	05%

* circled numbers indicate significance beyond .05 level

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encircled.*

The data in Table 2 suggest, first, that family socio-economic indicators account for variance in child test performance, as expected; and second, that socio-contextual forces as reported by the teacher are significantly related to child test scores. With the exception of Math Computation and Raven's Progressive Matrices, the forces factors account for increments of test score variance ranging from 17% to 28% over and above the variance accounted for by the co-variates. On the Mathematical Computations and Raven's Matrices test the contextual forces account for only 5% of test score variance, or less than one fourth as much as that explained on the other tests.

Clearly the most salient factors are *School Administration, Environmental Conditions* and *You, Yourself*. The *Teaching Staff* factor relates only to the Word Knowledge subtest, and the *Parents* factor relates only to the Raven's.

In general, the pattern of force factors is similar across the verbally loaded sub-tests. Only *Environmental Conditions* relates to math computations, and only *School Administration* and *Parents* relate to the Raven's test. It is interesting to note that the *Environment* factor consistently related to test scores in a negative direction, while the *You, Yourself* and *School Administration* factors relate in a positive direction.

DISCUSSION

From these data it is clear that socio-contextual factors are significantly related to child achievement.

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*Error terms may be correlated within classrooms. However, this potential problem had negligible consequences for these data. A re-analysis at the classroom-level of aggregation showed the standardized regression coefficients to be comparable to each predictor in both analyses.

Moreover, there is every indication that the classroom teacher is well aware of the particular constellation of forces she is dealing with and gives a good account of them through the *Environmental Forces Inventory*.

The exact linkage between socio-contextual variables and child achievement is not altogether clear, but some specific relationships may be noted from these data. The higher the teacher rates herself as a strong, positive influence, the higher the child achievement. Also, child achievement is higher when the classroom teacher reports that the *Principal* and *Central Office Administrative Staff* are positive influences. Curiously enough, child achievement is also higher when the teachers report the *Environmental* influences to be more negative.

The negative relationship between force ratings on the *Environmental Conditions* and child achievement scores could be explained in a number of ways. It is possible that the Responsive Education Program is having its most powerful effect, at least in terms of child achievement, in poor schools where physical facilities are inferior. Another possibility is that materials have an unsuspected negative impact: in the "physically enriched" classroom, over stimulation may detract from the lessons and skills taught. In the spartan classroom the teachers may have to make special efforts to make the best use of existing materials, equipment and space to enhance learning, and this special concentration may result in better learning experiences for children.

Since the factor structures were not totally consistent across the analytic and cross-validation sample groups, the relationship of specific forces to specific child outcomes may have limited generalizability and needs further study.

Reports to the contrary notwithstanding, it may be that schools are not failing--at least not all schools. And where the schools operate to support the teacher, children are learning more. It is possible that, to some extent, this effect reflects a greater

tendency on the part of teachers with high-achieving children to depict the administration as supportive and themselves as competent. However, from our observation and experience, it is more plausible that socio-contextual variables like the ones examined in this study do, in fact, affect child achievement.

A teacher's work space is constantly influenced by a number of circumstances and individuals that enhance the teaching/learning process or detract from it. When the teacher sees positive value in these influences, and feels they support her role and facilitate her work space, she may act more in control of her work space with the ultimate benefit being manifested in the child. These data imply that higher levels of teacher self perception and perceived administrative support can result in improved child outcomes. That this study finds such a relationship may be attributed to the population of schools on whom the study was done. The schools in this study are Follow Through schools, identified in the late 60's to receive federal support *and* to work with a program sponsor to implement a particular educational model. These schools, where teachers were implementing a consistent educational model (10), may provide a new setting for studies of teaching behavior and child effects.

Still, these results raise a series of questions about the relationship of socio-contextual variables to child achievement. Do teachers' perceptions of these forces actually predict achievement? If we collected achievement data on a pre/post schedule and assessed forces throughout a year, which force set would predict best? If we changed the way the various forces operate, through staff development or by design, would subsequent child achievement reflect the change? Current attempts to answer these questions are motivated by the strength of the relationships found in this study.

The direct implications of this study for teachers may be minimal: whatever their working conditions, they must do the best they can. The implications of the study for teacher support personnel and

school administration, however, are profound. With documentation that the collective influence of forces relates to child achievement, that child achievement scores are higher in a more "supportive," organizationally healthy environment, and with information on how selected forces influence teachers, efforts to change or modify forces to create a healthy work environment become possible. Environmental forces data can be used in a classroom, school or school district to assess the needs for inservice training for teachers, principals or other school personnel. Forces data can also be used at a national level to monitor and evaluate program implementation. It is apparent that measures are needed to meaningfully "take the temperature" of an organization. By enhancing forces, we can insure that a healthy, adaptive work environment is maintained for students and teachers.

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