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A Search For Variables That Affect School Climate in Hawaii

John A. Thompson and Sandra Young

One of the strands of the movement aimed at creating or enhancing citizen participation in the decision making in public schools has been the assessment of the perceptions of the climate of the school by various publics. Climate assessment is not a new concept; it has been carried on for at least 40 years. However, with the advent of an increased interest in shared and decentralized decision making the idea of climate as one of the measurement tools for determining the over all "health" of a school has assumed added importance.

While climate is a somewhat global concept involving a generalized perception of a school by its publics, the question remains as to whether there are variables within the context which are related to, and may have some explanatory power in, determining climate scores. Are there groups of such variables which are predictors of higher or lower climate? Are there groups of school related variables that account for a significant amount of variance in climate scores among schools? Among the groups, are there single variables that differentiate between higher and lower climate schools?

All of these questions are investigated within an educational environment that allows for the control of a number of organizational variables which might confound the results in other states. The State of Hawaii has the only statewide public school system in the United States. Also, no property tax is levied for the support of public education. Thus, the effects of governance and tax concerns (specifically as they apply to local education) are controlled. The previous statement is not meant to intimate that citizens in Hawaii do not have concerns about governance and taxes, only that these matters do not vary because of different policies in various areas of the state.

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Relevant Literature

There has been no paucity of studies in the general area of school climate. The search for a way to describe climate began three and one-half decades ago when Halpin and Croft (1963) first identified the need to address the "personality" or "climate" of the workplace as an important construct in the study of organizations. As the theory and administration of the business world began to impact on the educational scene, it was inevitable that the school would become a focal point for climate studies. The interest in this type of study has been so great that a number of taxonomies of definitions and synonyms, i.e., social system, open or closed environment, "press," atmosphere, "feel," culture milieu, personality, etc. have been investigated and explored in hundreds of research studies (Anderson, 1982).

Kelley (1980) refers to climate as "prevailing or normative conditions which are relatively enduring over time and which can be used to distinguish one environment from another. Climate conditions, as perceived by persons who work within, or know, a particular environment, serve as the basis for establishing expectations and interpreting events or activities which occur within that environment.

Beginning in the sixties, studies have centered on a variety of aspects, such as school size, facilities, or school climate type (Flagg, 1964; McPartland & Epstein, 1975; Rutter et al., 1979), student background, achievement and sex (Herr, 1965; Brookover & Lezotte, 1979; McDill & Rigsby, 1973), and principal characteristics or performance (Weber, 1971; Wiggins, 1972; Ellett & Walberg, 1979; Brookover et al., 1979; Kenworthy, 1989). Other studies have investigated the relationship between school climate and teacher-related variables such as age, experience, educational level (Miller, 1969; Kimpston & Sonnabend, 1975; Brookover & Lezotte, 1979) and parent/community characteristics such as socioeconomic status, and parent involvement with the school (Phi Delta Kappa, 1980; Hoover–Dempsey, Basslet & Brissie, 1987).

This study examines school climate as delineated by scores derived from the CFK, Ltd. School Climate Assessment Scale, and its relationship to 88 school-related, student-related, teacher related, principal-related, and parent/community-related variables.

Hypothesis

The major hypothesis tested was "There is no discrete set of multiple predictors that can be used to discriminate between higher and lower climate schools."

However, due to methodological limitations of the statistical technique employed, it was necessary to establish three subhypotheses to be able to test the major hypothesis. These were: There is no discrete set of (I) Input, (2) Institutional, and (3) Output variables which will produce a non-chance classification of schools on the basis of higher or lower climate.

The second hypothesis was: There is no univariate variable which will produce a significant difference between higher and lower climate schools.

A third hypothesis set as an ancillary question, "Is there a set of multiple predictors which would describe a significant percent of the total variance in scores on the climate instrument?"

Population and Sample

The population to which this study sought to generalize consisted of the 121 elementary schools in six of the public school administrative sub-districts in the state of Hawaii. The CFK Ltd., School Climate Assessment Scale had been administered in three of these sub-districts. The study utilized a sample of 41 elementary schools out of a total of 52 which had participated in the climate survey. These particular 41 schools were included in the sample because the same principal was

the administrator at the school at the time the survey was conducted as well as during the following school year. The predictor data which were collected for this study, consisted of 88 parent/community-related, teacher-related, principal-related, school-related, and student-related variables, that were also gathered from the information files in the Hawaii State Department of Education (DOE).

The question of whether the 41 schools in the sample had characteristics similar to the population was tested by carrying out a series of fourteen chi-square tests on variables such as size of student population, teacher size, experience, principal experience, age, sex, and several community demographics. With the exception of sex of the principal in one of the sub-districts (although not the other five), there were no significant differences between the sample schools and the population. Thus generalizations appeared to be warranted.

Selection of Variables

The criterion variable in the study, School Climate Scores, were derived by totaling, then dividing the mean scores on the CFK Ltd. School Climate Assessment Scale of three stakeholder groups (the parental community, teachers, and classified staff) within each school. These produced mean School Climate Scores which ranged from a low of 6.80 to a high of 10.60.

The 88 predictor variables were selected from a larger list of potential variables which had been generated from both previous studies and observations in the schools. A decision was made to classify the variables into an input–output model which separated the large number into five groups. (A list of the variables is included in Appendix 1). One group consisted of 15 input variables, the parental community-related variables, which consist of those characteristics which students bring with them upon entering the school system. The characteristics which are directly associated with the schooling process and system were termed the Institutional Variables. They were divided into three groups which included 15 teacher-related variables, 36 principal-related variables, and 16 school-related variables. The fifth group consisted of the student Output variables. These consisted of 6 student achievement or behaviorally related measures.

The data on the criterion variable were derived from the CFK, Ltd., School Climate Assessment Scale scores. With the exception of the information on the scores of the principals on the Minnesota Satisfaction Questionnaire, all of the data regarding the predictor variables were gathered from existing files found in various locations of the DOE Department of Information System Services.

Design of the Study

This study utilized a criterion-group ex post facto design in which the two criterion groups were identified as higher and lower climate schools.

The purpose of the study was 1) to ascertain the relationship between the 88 predictor variables which were organized into five groups of input–output measures, and higher and lower climate schools, 2) to determine if statistical differences existed between the mean scores of variables which may have been identified as differentiators of higher and lower climate schools, and 3) to discover if there was a combination of variables which would describe the variance in the climate scores of the schools.

Data Gathering Procedures

Demographic information generated from DOE files and data gathered from two instruments, were utilized in this study. The latter included the CFK, Ltd., School Climate Assessment Scale (scores of which were used as the criterion variable of this study), and the Minnesota Satisfaction Questionnaire (21 of the scales used as principal-related predictor variables).

To determine the range of scores for higher and lower climate schools, a frequency distribution was run on the 41 climate scores. From the frequency distribution, three clusters of scores were delineated: a higher climate group of 17 schools, a lower climate group of 17 schools, and a group of seven schools which were titled Unclassified. This third group was later used to test the utility of the classification equation. A t-test of means was performed and determined that the lower and the higher climate groups represented different populations beyond the $p = < .05$ level.

Findings

The three preliminary or sub-hypotheses were examined, the results of each were used to test the major Hypothesis. SubHypothesis 1 was derived to determine whether a set of Input (Parent/Community-Related) variables could be found that would produce a non-chance classification of schools into either higher or lower climate. Six predictor variables were found by using a stepwise discriminant function analysis. Three positive canonical coefficients were identified. These were Percent Caucasian Students, Percent of Families on Public Assistance, and Percent of Students of Chinese descent (identified in the text as Percent of Chinese Students). Three negative canonical coefficients were also identified. These Families with Parent(s) Unemployed, Percent of Families with Federal Connections, and Percent of Single Family Households. Thus, the null hypothesis that there is no discrete set of input variables that will produce a non-chance classification of schools into either higher or lower climate was rejected.

The second sub-hypothesis examined the question, "Is there a set of Institutional variables that will produce a non-chance classification of schools into either higher or lower climates?" Nine Institutional variables were identified as predictors in the runs of stepwise discriminant function analyses. These were six Minnesota Satisfaction Questionnaire (MSQ) job satisfaction reinforcers, Ability Utilization (the chance to do something that makes use of my abilities), Authority (the chance to tell other people what to do), Compensation (my pay and the amount of work I do), Co-workers (the way my co-workers get along with each other), Creativity (the chance to try my own methods of doing the job), and Responsibility (the freedom to use my own judgment) and three demographic variables (Administrative Tenure, Female Principals, and School Tenure) for the principals in the study.

Upon examining the Teacher-related factors, six discriminators were found. These were Percent of Caucasian Teachers, Percent of Teachers Age 56 and Older, Percent of Filipino Teachers, Percent of Teachers Age 35–45, Percent of Teachers Age 46–55, and Percent of Other Teachers (which means teachers with ethnic identities other than Caucasian, Japanese, Chinese, Filipino, Black).

A final set of Institutional variables, those which are associated with the school itself, were identified. They were Total Number of Teachers (in the school), Student Average Daily Absence, and Number of Crisis Suspensions.

Hence, as a result of the findings in which 18 Institutional variables were identified as predictors, the null hypothesis, that there is no discrete set of Institutional variables that will produce a non-chance classification of schools into either higher or lower climate, was rejected.

In the examination of Sub-Hypothesis 3, the null hypothesis that there is no discrete set of Output variables which would produce a non-chance classification of schools into

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Table 1
Results of Action and Steps of Stepwise Discriminant Function Analysis of Predictor Variables

RESULTS OF ACTION OF VARIABLES IN ANALYSIS AFTER STEP 11 —

Step Entered	F to Remove Score	Variable Identified	Wilks' Lambda	Sig.	Stand. Canon. Coeff.
1	8.9970	% Age 56+	.79822	.0087	0.86022
2	2.2903	Creativity	.67415	.0027	0.46752
3	15.037	% Fed. Connect.	.58127	.0011	–1.53391
4	15.920	Ave. Daily Ab.	.47345	.0002	–1.15965
5	15.107	% Age 35–	.32797	.0000	1.09565
6	9.1476	% Chinese Stud.	.27232	.0000	0.88107
7	3.3303	% Other Tchrs	.25285	.0000	–0.50705
8	3.8167	Co-workers	.22861	.0000	0.60876
9	1.5025	Total Tchrs.	.20913	.0000	–0.42880
10	1.7700	% Cauc. Tchrs	.19930	.0000	0.49828
11	1.1810	Crisis Susp.	.18869	.0000	0.31648

CANONICAL DISCRIMINANT FUNCTIONS—

Eigenvalue	% Variance	Canonical Correlation	Chi-Square	D/F	Sig.
4.29928	100.00	0.9007292	42.525	11	0.0000

CLASSIFICATION RESULTS—

Actual Group	No. of Cases	Predicted Group Membership Group 1	Group 2
Group 117 Lower Climate	17	0 100%	0.0%
Group 216 Higher Climate	1	15 6.2%	93.8%

Percent of "Grouped" Cases Correctly Classified: 96.97%

either higher or lower climate was not rejected. No set of Output variables could be identified, which met the significance criteria ($p = < .05$).

The major hypothesis examined the question, "Can a set of multiple predictors be identified that can be used to discriminate between higher and lower climate schools." All of the 24 Input and Institutional variables which were identified in testing the preliminary sub-hypotheses were examined in a series of stepwise discriminant function analyses to ascertain an answer. A set of eleven predictors which qualified as having significant canonical correlations was identified (see Table 1). Seven of these variables predicted classification into the higher climate group. These were Teachers Age 35 or Younger, Percent of Chinese Students, Percent of Teachers Age 56 or Older, the MSQ sub-scale Co-workers, Percent of Caucasian Teachers, the MSQ Creativity, and Number of Crisis Suspensions. The variables which produced negative relationships were Families with Federal Connections, Average Daily Absence, Percent Other Teachers, and Total Number of Teachers.

The eigenvalue for this culminating run was a robust 4.29928. Classification results were also very strong as 96.97 of the cases were correctly classified into higher or lower school climate based on these discriminators.

Therefore, the findings as presented in Table 1 resulted in the rejection of the hypothesis that there is no discrete set of multiple predictors that can be used to discriminate between higher and lower climate schools.

To test the accuracy of the model which classified schools into higher or lower climate a question was asked whether the 11 variables identified as significant discriminators in the first hypotheses could accurately classify the seven schools which were included in the Unclassified group of climate scores. Stepwise discriminant function analysis was used to test the accuracy of the classification model. The results showed that 100 percent of the schools with school climate scores ranging between the higher and lower climate groups, could be correctly classified; that is the three schools with lower actual scores were predicted as lower and the four higher schools were classified as higher classified by using the model (see Table 2 for the classification results).

This set of eleven significant discriminators predicted higher and lower climate on a multi-variate level. The second hypothesis was tested as to whether any of these predictors

Table 2
Summary of Classification Results of Predictor Variables Using Discriminant Function Analysis

Actual Group	No. of Cases	Predicted Group Membership Group 1	Group 2
Group 1 Lower Climate	17	17 100%	0 0.0%
Group 2 Higher Climate	16	1 6.3%	15 93.8%
Ungrouped	7	3 42.9%	4 57.1%
Total	40		

Percent of "grouped" cases correctly classified: 96.97
Percent of "ungrouped" cases correctly classified: 100.0%

were robust enough to differentiate among schools on a univariate basis. A null hypothesis of no significant difference among higher and lower climate schools for each of the variables which had been identified as multiple classification predictors was established. One-way analysis of variance was employed to test these hypotheses. Seven of the 11 and Institutional variables produced significant differences at or beyond the p = < .05 level.

The Positive contributors were identified as Percent of Chinese Students (a Parent/Community-related variable), Creativity, and Co-workers (MSQ subscale factors related to principals) and the Percent of Teachers Age 56 and Older. Of the three school-related variables, the Number of Teachers in the School and Average Daily Absence were identified as negative contributors to school climate. The Number of Reported Crisis Suspensions was also significant, however, in testing for the homogeneity of variance in these seven variables, using the Bartlett's Box F statistic, one variable, Number of Reported Crisis Suspensions, was identified as violating the homogeneity of variance criteria. Consequently, caution should be taken when making conclusions about this variable.

The third hypothesis raised the question of whether the variables identified as predictors would explain a significance amount of the variance in the climate scores. The data indicated that this was indeed possible. Using a stepwise multiple regression analysis, using the variables previously reported (see Table I) the output included five Institutional variables, but none of the Input, variables. The findings are reported in Table 3. Two were Principal-Related and Creativity and Activity variables (which predicted 24 percent and 13 percent of the variance, respectively), one School-Related, Average Daily Absence variable (which accounted for 17 percent of the variance), and two Teacher Related Institutional variables, percent of Chinese Teachers and Percent of Teachers Age 35 or Younger (which accounted for about 5.6 percent and 6.7 percent of the variance, respectively). These five variables accounted for a very respectable 66.4 percent of the total variance in the Climate scores of the 41 schools.

Conclusions

From the statistical analyses used in examining the hypothesis, several conclusions may be formulated. First, there are factors which appear to be related to school climate in elementary schools in Hawaii, and these factors may be identified by use of multivariate analysis statistical techniques. A set of 11 Input and Institutional factors were identified as statistically significant discriminators of higher or lower school climate. The resulting eigenvalue of 4.29928 demonstrated that the strength of the discriminators was very substantial and the correct classification of 40 of 41, or 96.97 percent of the total number of cases into climate groups illustrated the accuracy of the model.

Table 3
Results from Stepwise Multiple Regression Analyses Indicating the R Square and Beta Weights of the Predictor Variables with School Climate as the Criterion

STEP	VARIABLE	MULT. R	R SQUARE	ST. ERR.	B	BETA
1	Creativity	.4884	.2385	.6472	.1565	.6912
2	Av. D. Abs.	.6410	.4109	.1723	−.3907	−.6173
3	Activity	.7355	.5409	.1301	−.1015	−.4324
4	% Chin. Tch.	.7727	.5971	.0561	.0422	.2978
5	% Age < 36	.8150	.6643	.0672	.0272	.2957
	(Constant)				9.8684	

Consequently, a discriminant function model can be a tool for describing the multiple relationship between variables that are related to climate. This tool has revealed some specific aspects of "the place called school" which bring us closer to being able to identify some of the roots of the construct of climate. It is a first step toward focusing on specific aspects in schools which are related to and may influence climate rather than the more general statements on the subject which are often found in the research.

Secondly, the model utilized a large number of easily attainable demographic variables which are generally available in school districts throughout the United States. Therefore, replication of the process and statistical analyses performed on these variables is feasible.

Next, the results of the study indicated that the Output variables (Student Achievement-related factors) were not significant predictors of school climate, nor were they correlated with any of the predictor variables. In the six sub-districts to which this study sought to generalize, academic success, or the lack thereof, does not appear to have a major impact on the perception of groups on the climate of the school. This challenges a number of findings in the literature which have linked positive school climate to high student achievement scores. It is particularly interesting since the teachers were a prominent part of the response set of the CFK, Ltd. School Climate Assessment scale.

Another conclusion borne out by this study related to the failure of the usual predictors of school climate to be identified as significant discriminators. Per Pupil Expenditure, Compensation, Principal's Administrative Tenure, Median Family Income, Number of Sick Leave Days Taken by Teachers, and Percent of Student Transiency have been identified in other studies as indicators of lower school climate. These factors were not found to be significant variables which relate to either lower or higher climate in this study.

Of five variables identified in the prediction equation, the MSQ principal-related variables of Creativity (the chance to try my own methods) and Activity (being able to keep busy all the time) were found to contribute 37 percent of the variance in climate scores. It is noteworthy that this finding reinforces the Kenworthy (1988) study in which Creativity and Activity were the only factors found to be significant predictors of school climate. The importance of these factors, in particular, were dramatically shown in the first stepwise multiple regression run when the Minnesota Satisfaction Questionnaire scores were included with all of the predictor variables. With the MSQ factors included, the regression analysis accounted for 66.4 percent of the variance. When these scores of the principals were eliminated, the amount of variance described dropped to 39.5 percent. Thus, it appears that certain measures of satisfaction of the principals (as captured in the MSQ) seem to be important indicators of school climate.

Other results of the multiple regression analyses proved to be notable. Two teacher-related factors contributed significant variance to the model. These were Percent of Chinese

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Teacher, which was determined to contributed 5.6 percent, and Percent of Teachers Age 35 or Less, which was responsible for 6.7 percent of the variance. Together, these variables were found to contribute about 12 percent of the total contribution of 66.4 percent, which the prediction equation was able to correctly identify.

The descriptive statistics of the two variables were as follows. The mean for Percent of Chinese Teachers was 4.6 percent of the teaching force with a range of zero to 20.0 percent. The standard deviation was 5.155. The mean for Percent of Teachers Age 35 and Less was 17.3 percent while the range was zero to 37.5 percent. The standard deviation was 8.437. It is interesting to note that in both variables the ranges differed greatly, yet the two factors were found to be related to higher climate. Thus, it may be concluded from the data that in school where there are a larger percent of Chinese teachers and a larger percent of relatively young teachers, climate is likely to be higher. Attempts to ascertain the causal aspects of these findings would be an interesting question to address in another study.

Finally, Average Daily Absence was found to be an important negative predictor variable in both of the techniques of analysis. While it would be expected that there might be lower school climate in schools where student attendance is very poor, the descriptive data on Average Daily Absence showed that the mean for the sample was 5.3 days and the range was from 3.1 to 8 days of absence, which is not excessive. It may be concluded then that even when the number of absences is relatively small in a school, it is a factor which is closely related to lower climate. An administrator would do well to keep accurate records and a watchful eye on trends of growing absence in a school.

The purpose of this study was to try to determine whether there was a set (or sets) of multi-variant factors that are related to school climate in Hawaii. Also whether they have, at least, some explanatory power in terms of the influence they exert on the direction (higher or lower) of climate scores. It is clear that such an interactive set of variables does exist and that there is a high probability that the findings in the sample schools can be generalized to the balance of the elementary schools in the state. Most of the variance occurred in what is termed the Implementation variables, that is a set of things over which the schools have, at least, nominal control. This is important because it suggests that if schools (or a school district) is interested in changing the overall perception of its stakeholders that these are things over which they exert control which can be modified and such change may help to achieve that end.

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APPENDIX 1

A List of the Variables Included in the Discriminant Function Analysis

Input: Parent/Community Variables
- Ethnicity
  - % Chinese Students
  - % Filipino Students
  - % Part-Hawaiian Students
  - % Japanese Students
  - % Caucasian Students
  - % Other Students
- % Federally Connected Students
- % Families on Public Assistance
- % Students on Free–Reduced Lunch
- % Of High School Graduates in the Attendance Area (U.S. Census)
- % Of College Graduates
- % Of Unemployed in the Attendance Area
- % Of Single Parent/Households in Attendance Area
- Family Size
- Median Income in the Attendance Area

Input: Institutional Variables
- Principals
  - Age
  - Administrative Tenure
  - Tenure at the School
  - MSQ Sub-scale
  - Ability Utilization

- Achievement
- Activity
- Advancement
- Authority
- Company Policies
- Compensation
- Co-workers
- Creativity
- Independence
- Moral Values
- Recognition
- Responsibility
- Security
- Social Service
- Social Status
- Supervision–Human Relations
- Supervision Technical
- Variety
- Working Condition
- General Satisfaction

Input: Teacher-Related

- Ethnicity
  - % Chinese Teachers in the School
  - % Japanese Teachers in the School
  - % Filipino Teachers in the School
  - % Part-Hawaiian Teachers in the School
  - % Caucasian Teachers in the School
  - % Mixed
  - % Other
- Experience
  - % 1–5 years
  - % 6–10 years
  - % 11–20 years
  - % 21 plus years
- Age
  - % 35 or less
  - % 36–45
  - % 46–55
  - % 56 plus

Input: Institutional

- Number of Sick Leave Days Taken
- Total Number of Teachers in the School
- Total Enrollment
- Per Pupil Expenditures
- % Student Transiency
- District Exceptions—In
- District Exceptions—Out
- Average Daily Absence
- Number of Crisis Suspensions
- Number of Regular Suspensions
- Number of Class A Incidences
- Number of Class B Incidences
- Number of Class C Incidences
- % Special Education Students
- Number of Students of Limited English Proficiency

Output:

- SAT Reading
  - % Above Average (7–9 Stanine)
  - % Average (4–6 Stanine)
  - % Below Average (1–3 Stanine)
- SAT Mathematics
  - % Above Average
  - % Average
  - % Below Average

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