

Student achievement and elementary teachers' perceptions of school climate

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Abstract Teachers' perceptions of school climate in 59 elementary schools were assessed using a modified version of the School-Level Environment Questionnaire (SLEQ). Using structural equation modelling, a statistically significant, positive relationship was found between school mean teachers' perceptions of school climate and school mean student achievement. A second model showed that school and community context variables mediated that relationship. In schools in high socio-economic status (SES) communities, the influence of school climate on student achievement was stronger than it was for schools in lower SES communities. Recommendations for further examination of the relationships are also made.

Keywords School climate · School-Level Environment Questionnaire (SLEQ) · Structural equation modelling · Student achievement · Teacher perceptions

Introduction

School climate is a term that is commonly used but one without a commonly agreed upon definition. Depending on the study, school climate might be called school environment or school-level learning environment. School climate could mean the social system of shared norms and expectations (Brookover et al., 1978), the set of norms and expectations that others have for students (West, 1985), the psychosocial context in which teachers work and teach (Fisher & Fraser, 1990), teachers' morale (Brown & Henry, 1992), level of teachers' empowerment (Short & Rinehart, 1992), students' perceptions of the "personality of a school" (Johnson,

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Johnson, & Zimmerman, 1996, p. 64), the environment for students indicated by things such as amount of negative student behaviour in the school (Bernstein, 1992), or the physical and emotional health of the organisation (Freiberg, 1999). School climate can either be seen as a construct representing the involvement of everyone in a school or as something that is primarily a function of the teachers or of the students.

Coming out of the field of educational administration, much of the school climate research is based on the assumption that schools are formal organisations (Rentoul & Fraser, 1983). In the early research, quality of school climate was measured by structural characteristics like size, resources and teacher/student ratios. Docker, Fisher, and Fraser (1989) described Moos's work on human environments. Moos described three types of dimensions that are common in a variety of psychosocial environments—relationship dimensions (the nature and intensity of personal relationships), personal development dimensions (how people grow), and system maintenance and system change dimensions (how well the system responds to change, is orderly and has clear expectations). All of these types of dimensions, according to Moos, should be taken into account when trying to gain an understanding of any human environment.

Fisher, Docker, and Fraser (1986) described the history of school climate research beginning with Pace and Stern's College Characteristics Index (CCI). The CCI was used to study student and staff perceptions of the environments of colleges and universities in the 1950s. Other school climate instruments include Coughlan's School Survey in the 1960s, which measured teachers' perceptions of the school environment; Halpin and Croft's study of teachers' perceptions of elementary school climates using the Organizational Climate Description Questionnaire in the 1960s; Stern's High School Characteristics Index (an adaptation of the CCI for use in high schools) in the 1960s; and McDill, Rigsby and Meyer's work in the 1960s in which they found a relationship between climate scales and mathematics achievement (see Fisher et al., 1986).

An important study of the relationships between school climate and student achievement was reported by Brookover et al. (1978). Looking at school climate as a shared social system of both norms and expectations, the viewpoints of students, teachers, and administrators were all considered. Brookover and colleagues used a multiple regression analysis to examine the proportion of variance in Grade 4 students' achievement tests in Michigan that was explained by school climate above and beyond socioeconomic status (SES) and ethnicity. They found that school climate was as good or better at predicting student achievement than were SES and ethnicity. The proportion of variance explained, though, varied a great deal, from only 4% for a statewide sample of schools to 12% in primarily White schools and 36% in primarily African-American schools.

Results of other studies examining the relationships between school climate and achievement have been mixed. Hoy and Hannum (1997), studying the health of school climate in New Jersey middle schools with the Organizational Health Inventory (OHI-RM), found that school climate was related to student achievement above and beyond SES. Similarly, West (1985), in a study of urban elementary schools in New Jersey, found that school climate factors were important in predicting student achievement. Other studies, however, have failed to support a climate-achievement relationship. Mok and McDonald (1994), while investigating the psychometric properties of the Quality of School Life instrument, found little difference

between schools. The variation within schools was greater than the variation between schools. Phillips (1997) broke school climate down into two different aspects, academic press, the push in the school for academic achievement, and communitarian climate, the work climate for teachers. In an analysis of predominantly middle-class, African-American middle schools in eastern USA, Phillips found that student achievement and attendance were both more closely related to academic press than to communitarian climate.

What does this mean for studying school climate and its influence on student achievement? Fisher and Fraser (1991a) pointed out a need for studies of the relationship between teachers' perceptions of school climate and student achievement. Is the influence of school climate on student achievement similar for different schools, or is it mediated by community and school context? The present study was conducted to investigate the relationship between teachers' perceptions of school climate and student achievement and whether that relationship is mediated by community and school context.

Methods and procedures

Sample

The sample consisted of elementary schools in a southwestern USA city. As part of a larger study, the Teacher Preparation and Professional Development Survey (Stevens, McKernan, Smith, & Winograd, 1998), school climate, general satisfaction and demographic questions were distributed to teachers at elementary schools in a public school district. Participation in the study was voluntary. Fifty-nine of the 78 elementary schools in the school district participated in the study. There were 1115 teacher surveys from the 59 participating schools. Nine teacher surveys with more than 20% of the items missing (12 items) were excluded from the study. None of the remaining 1106 surveys were missing more than two items from any of the eight school climate scales. This resulted in a sample of 1106 completed surveys from teachers who volunteered to participate in the 59 elementary schools.

Variables, measures and instruments

This study examined the relationships between school climate, community and school context, and student achievement. Each of these constructs had several indicators. Table 1 shows the variables used in this study.

School climate in the present study is defined as the psychosocial environment in which teachers work with other teachers, students and administrators (Fisher & Fraser, 1991b). It was measured by asking teachers in each of the 78 elementary schools in the school district to complete an existing school climate instrument, the School-Level Environment Questionnaire (SLEQ). The SLEQ was chosen over other existing instruments because it was carefully developed and because it is used widely. The original SLEQ consists of a total of 56 items, with seven items each in eight scales: student support, affiliation, professional interest, staff freedom, participatory decision making, innovation, resource adequacy and work pressure (Fraser, 1994; Fraser & Rentoul, 1982). Exploratory and confirmatory factor analyses, as well as internal consistency analysis (Johnson & Stevens, 2001), led to the use of a

Table 1 Description of the variables used in this study

Construct	Variable	Indicator
School climate ^a	Affiliation	Mean factor score from the SLEQ
	Innovation	Mean factor score from the SLEQ
	Participatory decision making	Mean factor score from the SLEQ
	Resource adequacy	Mean factor score from the SLEQ
	Student support	Mean factor score from the SLEQ
Student achievement	Reading	Mean Grade 4 NCE composite score
	Mathematics	Mean Grade 4 NCE composite score
	Language	Mean Grade 4 NCE composite score
	Social studies	Mean Grade 4 NCE score
	Science	Mean Grade 4 NCE score
Community and school context	Education average	Weighted average adult education level
	Not free lunch	% of students not receiving a free or reduced-cost lunch
	Not single parent	% of community not single parent households
	Not LEP	% of students who are not classified as Limited English Proficient (LEP)

^a While the SLEQ school environment instrument was designed with eight factors in mind, only these five were included in the analyses in this study. They were chosen as a result of the factor analysis reported elsewhere (Johnson & Stevens, 2001)

shortened version of the SLEQ, called the Revised SLEQ, with 35 items arranged in the five scales shown in Table 1. This modified version of the SLEQ is included in the Appendix.

The second construct, student achievement, is a combination of scores on subtests of the Terra Nova Survey Plus standardised achievement test (CTB/McGraw-Hill, 1997) administered to Grade 4 students. The five subtest scores are shown in Table 1.

Community and school context was a combination of indicators of each school's community. The measures used were all taken from existing district data and are shown in Table 1.

Results

Assumptions

Before testing models with the variables of interest, all variables were checked for statistical model assumptions. Univariate normality tests included checks for outliers, kurtosis and skewness, as well as a trend analysis. No problems were found, except that the variable 'nonlep' was restricted in the upper range.¹

Multivariate normality of the five dependent variables, the student achievement subtests, was assessed using PRELIS 2.12a software (Joreskog & Sorbom, 1993) to calculate Mardia's coefficient. The multivariate test for kurtosis was not significant, $z = 0.945$, $p = 0.172$. The multivariate tests for skew, $z = 5.567$, $p < 0.001$, and for kurtosis and skew together, $z = 31.887$, $p < 0.001$, were statistically significant.

¹ Variable means, standard deviations and correlations are available on the Internet at: <http://www.ed.arizona.edu/johnson/climate.htm>

Table 2 Internal consistency (reliability) results for the revised SLEQ

Factor	Alpha reliability coefficient
Overall school climate	0.90
Affiliation	0.82
Innovation	0.79
Participatory decision making	0.78
Resource adequacy	0.86
Student support	0.77

Reliability

The internal consistency of the Revised SLEQ was estimated by calculating alpha reliability coefficients. Results are shown in Table 2. The instrument as a whole, measuring overall school climate, had a relatively high coefficient (0.90). Each of the five factors had acceptable reliability coefficients, ranging from 0.77 to 0.86 that are in the same range as those reported in previous studies of the SLEQ (Johnson & Stevens, 2001).

Structural model testing

Structural equation modelling (SEM) was used to examine the relationships between the major constructs of interest—school climate, student achievement, and community and school context. A major benefit of using SEM is that it allows the researcher to test theoretical or latent variables as well as observed variables. Indeed, Waxman (1991), in a review of the research on classroom and school learning environments, pointed out the lack of applications of SEM in studying learning environments and called for its use.

Two models were tested successively. The first model tested used only school climate as a predictor of student achievement. School climate had five indicators, namely, the school mean climate factor scores. Student achievement also had five indicators, the school means on the subtests of the Terra Nova.

Figure 1 shows the maximum likelihood parameter estimates that resulted from the SEM analysis. School climate had a positive relationship with student achievement, with a parameter estimate of 0.30, explaining 9% of the variance in student achievement. The subtests of the Terra Nova were good indicators of student achievement in this model, with coefficients ranging from 0.96 to 0.99. Two of the SLEQ factors, Resource Adequacy and Student Support, had only moderate coefficients on school climate of 0.62 and 0.58, respectively. The other three factors had higher coefficients of 0.80 to 0.90. All of the parameter estimates in the model were statistically significant at the 0.05 levels. Fit indices are shown in Table 3. This model examined the relationship between school climate and achievement while ignoring the influence of community and school context. Examination of the fit indices in Table 3 shows that the fit of this model was marginal according to commonly-used criteria for the interpretation of goodness of fit indices in SEM (Hu & Bentler, 1999).

In Model 2, shown in Fig. 2, community and school context was added as an influence on student achievement, both directly and as a mediator of school climate. Fit indices for this model are also found in Table 3 and show substantial

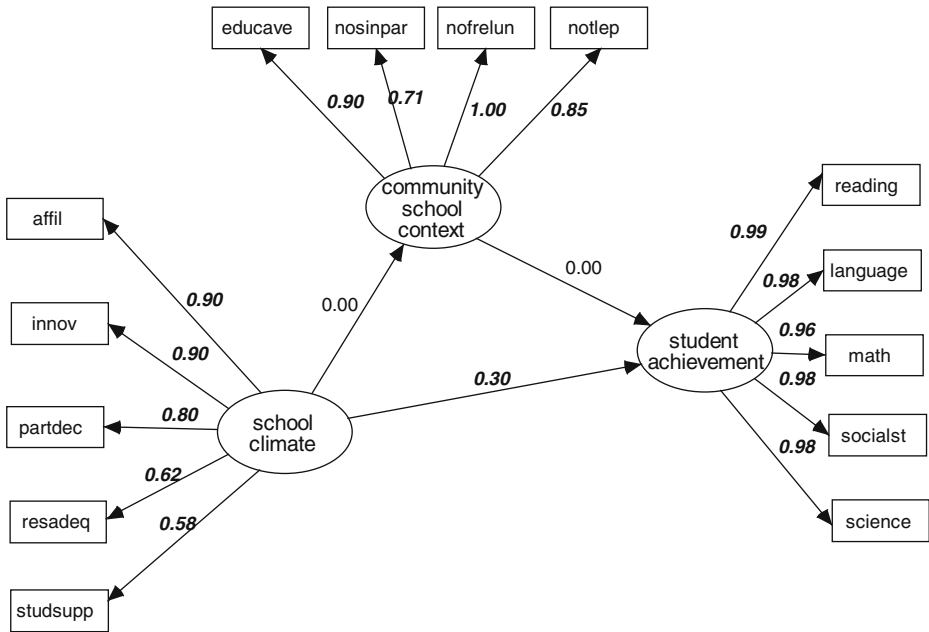


Fig. 1 Structural Model 1 with school climate to community school context constrained to zero and community school context to student achievement constrained to zero. *Note:* All coefficients are statistically significant ($p < 0.05$)

Table 3 Fit indices for structural models

Index	Model 1	Model 2
	School climate and student achievement	Add community and school context
Chi-square	201.05	110.73
df	76	74
Probability	0.001	0.004
Chi-square/df ratio	2.65	1.45
CFI	0.89	0.97
RMSEA	0.17	0.09
TLI	0.87	0.96
SRMR	0.38	0.14

improvement over Model 1 with a significant difference in chi-square between the two models, $\chi^2(2) = 90.32, p < 0.001$ and substantial improvement in CFI (0.08) and TLI (0.09). Both the CFI and TLI values in Model 2 indicate a relatively well-fitting model. In this model, the parameter estimating the direct relationship between school climate and student achievement (0.07) is much smaller, accounting for only 23% of the total effect. In fact, it is no longer statistically significant. However, the indirect relationship, with school and community context as a mediating construct, accounts for 77% of the total effect. Sobel’s test (Kenny, Kashy, & Bolger, 1998) for the significance of mediation indicates that the mediation effect was statistically significant, $z = 14.49, p < 0.01$.

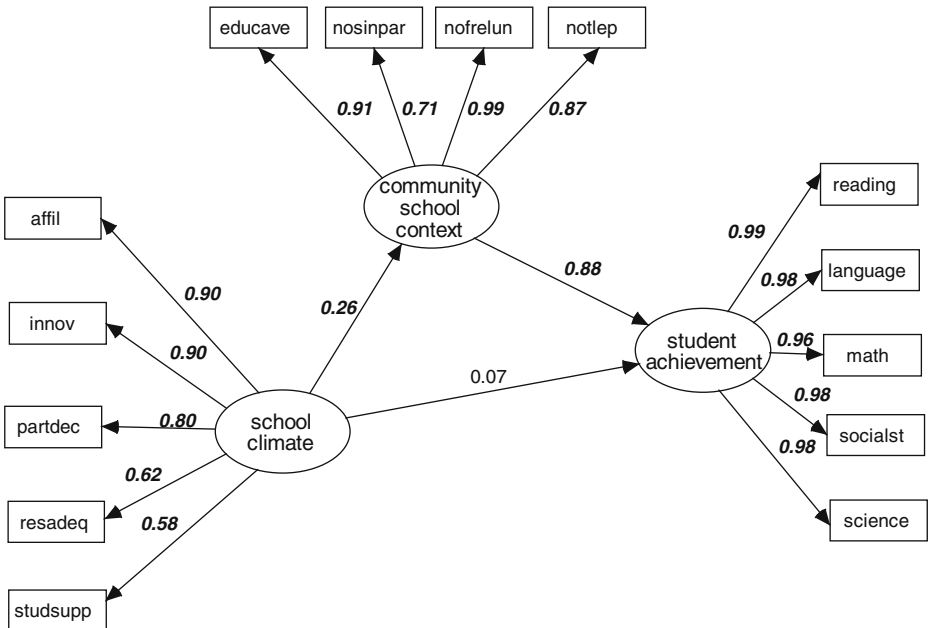


Fig. 2 Structural Model 2 with coefficients for all relationships free to vary (none constrained to zero). *Note:* Bold/italics coefficients are statistically significant ($p < 0.05$)

Discussion

Limitations

The first set of limitations for this study relates to the sample. While an attempt was made to include all elementary schools in the district, only 59 of the 78 schools had a large enough return rate to be included in the analysis. There were no statistically significant differences between the participating and nonparticipating schools in terms of the variables being measured, but it is not known whether responding teachers' perceptions of school climate were the same as non-respondents' perceptions. It is possible that the low rate of response from the 19 schools not included in the analysis was due to some extent to teachers in those schools having lower perceptions of school climate and lower general satisfaction. It also could be that those who responded had stronger feelings one way or another, felt under less pressure and so had more time to participate, or any number of other possibilities. There is no way to know if any of these factors are real, but the possibilities remain. It should be with caution, then, that these results are generalised to nonparticipating schools.

For the same reasons, the 52% of teachers from participating schools who responded could have had different perceptions from the 48% of teachers who did not respond. The response rate was high enough to be confident in the means that were used in the analyses provided that the teachers who responded were not substantially different from those who did not.

It is also important to remember that all of these results were from elementary schools in a medium-sized southwestern USA city with a large Hispanic population. The factors that emerged from the SLEQ, as well as the relationships between the

other variables of interest, might not be the same for middle or high schools, in other parts of the country, or in other countries.

Relationship between school climate and student achievement

There was a positive and statistically significant relationship between teachers' perceptions of school climate and student achievement. The 0.30 loading of school climate on student achievement, accounting for 9% of its variance, indicated that school climate is a factor worth considering in understanding school achievement. Schools in which teachers perceived a positive school climate, with a high degree of affiliation among teachers, an atmosphere of innovation, high involvement of teachers in the decision-making process, cooperative, friendly students, and adequate resources and facilities, had better average student achievement. It is certainly reasonable to think that these school climate factors influence student achievement, but it is likely that the opposite is true to some extent as well. High achieving students could be friendlier and more cooperative partly because they are doing well and so enjoy school. Teachers could feel more affiliation with their colleagues in an atmosphere of success than in one of failure. School climate probably influences and, in turn, is influenced by student achievement.

The fit indices for structural Model 1 were mixed. There could be several reasons why the model did not fit the data better. First, a sample size of 59 schools is small for use in structural equation modelling. Second, this model was based on school means that were aggregated from individual data. There would be more variance to explain if the individual results were used. Third, post-hoc modifications, which would have improved model fit, were not made. According to the modification indices, correlating the residuals between student support and innovation, as well as between the language and mathematics subtests, would improve model fit. Because each of these pairs is within a construct that was measured in a particular way, it is reasonable to think that there might be things that they shared that were not included in the model. Allowing them to correlate brought model fit into a better range (Johnson, 1998).

The main reason for caution in interpreting this relationship, though, is that the model was missing other factors that might influence both school climate and student achievement. One of those factors is the community in which a school is situated. Schools don't operate in vacuums. They are reflections of and contributors to the communities in which they are based. For this reason, community and school context variables were added to the model.

Addition of community and school context

The addition of community and school context variables changed the model in important ways, overwhelming the contributions of school climate and teacher characteristics. The direct relationship between community and school context and student achievement was strong, with a parameter estimate of 0.88 and accounting for 77% of the variance in student achievement. Further, the mediating effect it had on the influence of school climate on student achievement was substantial, accounting for over three quarters of the total effect.

Model fit with the addition of community and school context was substantially better than Model 1. Model 2 provided significantly better fit than Model 1 and most

fit indices for Model 2 (chi-square/df ratio, CFI, TLI) indicated good model fit. RMSEA, however, was higher than the maximum 0.05 or 0.08 level often accepted as showing good model fit.

While there was a moderate and statistically significant effect of school climate on student achievement, in the present study, it was mediated by school context. In high SES schools, school climate was positively related to student achievement. But, in lower SES schools, there was a smaller relationship between school climate and achievement. One possible interpretation of this result is that, in lower SES schools, there were other factors, not included in our models, that had a more direct influence on student achievement than school climate. Indeed, there is ample evidence that social class is strongly associated with academic achievement. Rothstein (2001) goes so far as to suggest that the impacts of poverty on student achievement is so strong that spending money to lessen poverty would have stronger effects on achievement than would increased spending on schools. Lower SES schools have been shown to have lower levels of funding (Biddle & Berliner, 2002) and higher levels of under-qualified teachers (Laczko-Kerr & Berliner, 2002; Padron, Waxman, & Rivera, 2003) than do schools in higher SES communities. Those problems could have influences in lower SES schools that are strong enough to overpower or mask the influence of school climate.

Recommendations for further research

While this study found a positive and statistically significant relationship between teachers' perceptions of school climate and student achievement, as well as a statistically significant mediating effect of school and community context, there is clearly a need to examine the relationship further. Several recommendations can be made. First, other mediating variables, identified by theory, should be included in models. Mediation hypotheses then could be tested directly. Second, multilevel models can be used rather than relying on school-level averages. Third, rather than relying on student achievement at one point in time, growth in student achievement could be used as an outcome construct. Given that a school cannot influence many characteristics of its students, such as basic ability or prior learning, schools can logically be expected to have more influence on growth in achievement. Finally, reliability of the construct of school climate over time should be tested. Teachers' perceptions of school climate could change at different times of the school year or be dependent on or influenced by major events in the school, such as a change in administration or publication of the school's test results in the local newspaper.

Appendix

Revised School-Level Environment Questionnaire (SLEQ)—items arranged by factors

Affiliation (af)

I seldom receive encouragement from colleagues.
Teachers frequently discuss teaching methods and strategies with each other.

I feel accepted by other teachers.
 Teachers avoid talking with each other about teaching and learning.
 I am ignored by other teachers.
 I feel that I could rely on my colleagues for assistance if I should need it.
 My colleagues seldom take notice of my professional views and opinions.
 I feel that I have many friends among my colleagues at this school.
 Teachers are keen to learn from their colleagues.
 I often feel lonely and left out of things in the staff room.
 Teachers show considerable interest in the professional activities of their colleagues.

Innovation (in)

Most teachers like the idea of change.
 New courses or curriculum materials are seldom implemented in the school.
 There is much experimentation with different teaching approaches.
 New and different ideas are always being tried out in this school.

Participatory decision-making (pd)

Decisions about the running of the school are usually made by the principal or a small group of teachers.
 It is very difficult to change anything in this school.
 I have to refer even small matters to a senior member of staff for a final answer.
 Action can usually be taken without gaining the approval of a senior member of the staff.
 Teachers are frequently asked to participate in decisions concerning administrative policies and procedures.
 I have very little say in the running of the school.
 I am encouraged to make decisions without reference to a senior staff member.
 I must ask a senior member of staff before I do most things.

Resource adequacy (ra)

The school library includes an adequate selection of books and periodicals.
 Video equipment, tapes, and films are readily available and accessible.
 Tape recorders and cassettes are seldom available when needed.
 Projectors for filmstrips, transparencies, and films are usually available when needed.
 Adequate duplicating facilities and services are available to teachers.

Student support (ss)

There are many disruptive students in the school.
 Most students are helpful and cooperative to teachers.
 Most students are pleasant and friendly to teachers.
 There are many noisy, badly behaved students.
 Students get along well with teachers.
 Most students are well-mannered and respectful of the school staff.
 Very strict discipline is needed to control many of the students.

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