Using School Climate to Positively Develop Youth

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Using School Climate to Positively Develop Youth

Academic achievement in schools is commonly measured by test scores and grades. Social supports within the school are often overlooked, but, as Haynes, Emmons, and Ben-Avie (1997) state, these factors have an influence in the academic success of students. School environment is critical for learning and development (Bronfenbrenner, 1994; Hopson & Lee, 2011; Haynes et al., 1997; Cohen & Geier, 2010; Benson, Scales, Hamilton, & Sesma, 2006). School climate involves a supportive school culture where students from diverse backgrounds feel welcomed and are welcomed (Nassar-McMillan, Karvonen, Perez, & Abrams, 2009).

This study of school safety/climate (SSC) examines the associations between what Haynes et al. (1997) call the interpersonal interactions and the interpersonal relations between school community, staff, parents and students. Family, teacher, and community support are forms of developmental measures that have been associated with school climate (e.g., Cabrera & Rodriguez, 2011). The Entropy index from Shannon's work on information theory (White, 1986) is used to calculate a measure of diversity at the school level to try to explain variation, which Nassar-McMillan et al. believe represents a critical element in school climate. These variables of interest are modeled while holding student background variables constant: self-reported average grades, free and reduced-lunch, gender, and ethnicity.

Three questions were asked: (a) How much variation in SSC is due to schools? (b) To what extent are social interaction variables associated with the perception of school climate for students? (c) Furthermore, to what extent is diversity within schools associated with SSC?

In a paper presented at the National Council on Measurement in Education, Albano and Rodriguez (2012) showed that SSC items on the Minnesota Student Survey (used in this study)

drift over time. This suggests that reported perceived improvements in SSC might actually be the result of changes in item parameters - perhaps students are becoming desensitized to school-based problems. If students are getting accustomed to their environment, there may be a need for external and indirect aid to improve their SSC.

In their comprehensive review of the theory and research on positive youth development, Benson, Scales, Hamilton, and Sesma (2006) identified six essential principles about which there is broad consensus, including (a) youth have the inherent capacity for positive development; (b) positive development is enabled through relationships, contexts, and environments that nurture development; (c) positive development is enhanced when youth participate in multiple meaningful relationships, contexts, and environments; (d) all youth benefit from these opportunities, the benefits of which generalize across gender, race, ethnicity, and family income; (e) community is a critical delivery system for positive youth development; and (f) youth themselves are major actors in their own development, serving as a central resource for creating the kinds of relationships, contexts, environments (ecologies), and communities that facilitate optimal development. The developmental contexts from an ecological perspective where youth are located interact with the inherent capacity of youth to grow and thrive; their developmental strengths, skills, competencies, values and dispositions; and two related aspects of developmental success, the reduction of high-risk behaviors and the promotion of healthy well-being or thriving (Benson, Scales, Hamilton, & Sesma, 2006). Benson et al. (2006) also identified three theoretical strands that contribute centrally to the theory of youth development, an area that integrates multiple theoretical orientations, including human development, community organization and development, and social and community change. The work in this area is exploring many aspects of context, all which might influence school climate.

Method

The methodology of this study is informed in part by *40 Developmental Assets* (Search Institute, 2004). This article provides a guide on the developmental assets to create measures obtained from our data. All measures are Rasch-scaled with Winsteps 3.74 (Linacre, 2012). Rasch scaling is used to create scale scores, providing scale (statistical) properties that make them stronger variables in general linear model based analyses. Rasch analysis also provides a strong tool to evaluate the rating scale structure of survey rating scale items and to estimate reliability of each measure. The study uses hierarchical linear model (HLM) analysis as the primary analysis with the perception of SSC measure as the outcome measure. The statistical software HLM6 is utilized to conduct the hierarchical linear model analysis.

Data

The Minnesota Student Survey (MSS) is designed by an interagency team from the MN Departments of Education, Health and Human Services, Public Safety, and Corrections to monitor important trends and support planning efforts of local public school districts and the four collaborating state agencies. The MSS is administered every three years to students in 6th, 9th, and 12th grades. During each administration year, all operating public school districts are invited to participate, including correctional facilities housing youths.

This study involves a secondary data analysis of the MSS. The study is a correlational research design that treats the data as cross-sectional data. The goal is to answer the research questions and explain this perception of SSC using both student and school level data; an HLM model can help produce the appropriate error terms that can take into account the within-school dependencies (Raudenbush and Bryk, 2002). This investigates the extent to which school characteristics may be able to explain variation in students' perceived SSC. The school level data

is from the averages across grades within year of the MSS, the National Center for Educational Statistics Common Core Database for 2010, and the Minnesota Department of Education for 2010. The correlational design allows for the variables of interest to correspond to examining variation in SSC but the design itself does not permit causal inferences. The analysis will use the data from students in Minnesota who took the survey in 2010 so generalizations will only be made to this population.

A list-wise deletion of missing values reduces our sample size. The student level data has approximately 11% of missing data and the school level data has approximately 1% of missing data. The final sample sizes for the model includes 74,626 students and 354 schools.

Data Analysis

Gender is used in the model to control for the differences between male and female in the perception of SSC; free/reduced-lunch is used as a control variable to approximate socio-economic status of the student and the school; and school locations city, suburb, and town/rural are used as control variables. There are four measures that were Rasch-scaled, including the outcome variable perception of SSC. The other explanatory measures are perceptions of teacher/community support (TCS), experience being bullied (B), and family support (FS). SSC items ask about how safe students feel about the school and how other students act in the school. TCS items focus on how teachers, friends, and other adults in their community treat them. FS items focus on student perception of how their parents feel about them. Finally, B items ask about the amount of bullying that students have experienced. As SSC increases in value, the student perceives more positive SSC. Similarly, an increase TCS and FS scores means more positive perception of TCS and FS, and as the scale score of B increases, the student reports to experiencing more bullying.

The within-school means of the Rasch scores were used at the school level to characterize the school, so the school-level scale score with a high TCS would tend to have a higher student perception of teachers and community support. A diversity index is also used at the school level to indicate the racial diversity of the school and its association with SSC. It focuses on the concepts of richness, the variety (number) of ethnic groups, and evenness, the extent to which the ethnic groups are evenly proportioned (Peet, 1974). At the student level, an ethnicity variable is used to control for any differences in perception of SSC among minority students and non-minority students. The GPA variable was obtained from the survey based on student-reported typical grades. In other analyses, the GPA functioned as expected, correlating highly with other survey-based questions regarding liking school, time on homework, and post-high school plans.

For the first step of multilevel analysis, a one-way random-effects ANOVA model, called the null model (described below), was fit using full maximum likelihood to assess the extent to which the school level explained variation in SSC. Using Raudenbush and Bryk's (2002) notation,

$$\begin{aligned} Y_{ij} &= \beta_{0j} + r_{ij} \\ \beta_{0j} &= \gamma_{00} + u_{0j} \\ Y_{ij} &= \gamma_{00} + u_{0j} + r_{ij} \end{aligned} \quad (1)$$

where Y_{ij} is the Rasch score for SSC perceived by the ith student in the jth school, γ_{00} is the grand mean of perceived SSC score for all students, u_{0j} is the school-level effect, r_{ij} is the student-level residual, and β_{0j} is the intercept and mean outcome for the jth school (level 2 unit). The r_{ij} is normally distributed with a mean of zero and a constant student-level variance, σ^2, which represents within-school variability and u_{0j} is the random effect associated with school j and

assumed to have a mean of zero and variance τ_{00}, which represents the population between-school variance.

The full model uses variables below to explain variation school climate among students and among schools. The level-1 model shows the model at the student level.

$$Y_{ij} = \beta_{0j} + \beta_{1j}(FRL_{ij}) + \beta_2(TCS_{ij}) + \beta_3(B_{ij}) + \beta_4(FS_{ij}) + \beta_5(Gender_{ij}) + \beta_6(Grade0_{ij}) + \beta_7(GPA_{ij}) + \beta_8(Minority_{ij}) + r_{ij} \quad (2)$$

This level includes variables directly related to the student. Each of the variables is centered at the group mean. Raudenbush and Bryk mentioned (p. 141) that group mean centering would directly show the relationship between the independent variable and dependent variable, therefore group mean centering was chosen, allowing the intercept, β_{0j}, to represent the unadjusted mean SSC for school j. Each of these variables has the potential to be modeled at the second level, but they are only used as control variables (covariates) for this research.

The level-2 model is:

$$\begin{aligned}
&\beta_{0j} = \gamma_{00} + \gamma_{01}(TCS_MEAN) + \gamma_{02}(B_MEAN) + \gamma_{03}(FS_MEAN) + \gamma_{04}(Proportion9) \\
&\quad + \gamma_{05}(GPA_MEAN) + \gamma_{06}(FRL) + \gamma_{07}(Diversity) + \gamma_{08}(City) + \gamma_{09}(Suburb) + u_{0j} \\
&\beta_{0j} = \gamma_{00} \\
&\beta_{1j} = \gamma_{10} \\
&\beta_{2j} = \gamma_{20} \\
&\beta_{3j} = \gamma_{30} \\
&\beta_{4j} = \gamma_{40} \\
&\beta_{5j} = \gamma_{50} \\
&\beta_{6j} = \gamma_{60} \\
&\beta_{7j} = \gamma_{70}
\end{aligned} \quad (3)$$

The level-2 model includes the school level data. The variables in this level deal specifically with the school (j) that student i attends. The variables are only modeled within the

intercept, meaning that the full model assumes that these variables only affect the average perception of SSC. The other variables from level-1 are fixed – constant across schools.

Results

A hypothesis test was used to test if there was significant variation between schools to include the school level effects.

$$H_0: \tau_{00} = 0$$

$$H_a: \tau_{00} \neq 0$$

The chi square values for the significance of the variance at level-2 were used. From Table 2, we can see that τ_{00}, the variance component of u_{0j}, is significant and that there is a need for a school-level model. We used the variance component to compute the intra-class correlation, the proportion of variation in SSC at the school level (due to school differences in SSC).

$$\rho_I = \frac{\tau_{00}}{\tau_{00} + \sigma^2} = \frac{0.457}{0.457 + 4.61} = .09$$

There was approximately 9% of variation between schools which says that the school-effects explain nine percent of the total variation of perceptions of SSC, so SSC varies somewhat by school (see Table 1). Similarly we can do the same for the within school variation using σ^2 in the numerator, where the student level accounts for approximately 91% of the variation in SSC.

Table 1

HLM Random Effects Results for Null and Final Models

Indices	Null Mod	Mod 1
Variance Component		
Level 1 Within-School	4.605	3.426
Level 2 Between-School	0.458	0.133
Intra-class Correlation	5.063	
Level 2 Between-School	.090	.037
Proportion Reduction		
Within		.26
Between		.71

A model including the variables of interest at level two is fit without allowing slopes to vary, called the full model. Since the variables of interest are at the school level, the proportion of variance is calculated between the models to show the amount of variation explained from the school-level variable. The slopes are not allowed to vary, so the proportion of variance is:

$$R^2 = 1 - \frac{\tau^2_{\text{fullmodel}}}{\tau^2_{\text{nullmodel}}} = 1 - \frac{.133}{.457} = .710$$

The full model explains approximately 71% of the variation at the school level. For the variables of interest, TCS, B, and Diversity are all significant at the school level, explaining variation in school-level SSC, all else constant. This means that on average, these variables are strongly associated with school level SSC as perceived by students. If we look at how much the full model explains the variation at the student level, we use the σ^2 in the same equation as above to get approximately 26% of variation explained at the student level with this model.

We standardized the fixed effects to enhance the interpretation. On average, an increase in the TCS score is associated with an increase in the average perception of SSC, whereas on average, an increase in the B score is associated with a decrease in the average perception of SSC. Finally, and most interesting, on average, an increase in the Diversity index of the school is associated with a decrease in the average perception of SSC. Proportion of students in grade 9, FS, and average GPA at the school-level do not add significant variation in predicting average SSC. See Table 2.

Before any further interpretation of these results, an in-depth analysis of the data helped to satisfy the normality and common variance assumptions of the data. Level one appeared supported from looking at figures 1 and 2. The student level residuals were normal (Figure 1) and there was relative homogeneity of variance across schools (Figure 2). There were a few outliers, but the majority of the schools were similar regarding within-school variance. The Q-Q plot in Figure 3 shows the difference between Mahalanobis distance measure for each unit versus the expected values of the order statistics from a chi square distribution for the school level to check the assumptions of normality. The alignment is suggesting that level-2 residuals are distributed normally, with the exception of a few outliers at the extremes, but the model does not appear to be grossly non-normal to severely affect the results.

Table 2

HLM Final Results

School-Level Variables	Null model fixed effect	se	Final model fixed effect	se	Standardized fixed effect
TCS Mean			*1.212	0.131	0.129
B Mean			*-0.658	0.080	-0.097
FS Mean			-0.046	0.122	-0.007
Proportion9			-0.314	0.123	-0.027
GPA Mean			0.174	0.187	0.014
FRL			*-0.006	0.002	-0.051
Diversity			*-0.777	0.105	-0.114
City			-0.116	0.095	-0.016
Suburb			-0.100	0.078	-0.016
Student-Level					
Intercept	*2.231	0.038	*2.215	0.022	
FRL			*0.054	0.018	0.010
TCS			*0.504	0.006	0.285
B			*-0.335	0.005	-0.241
FS			*0.081	0.005	0.057
Gender			*-0.395	0.014	-0.088
Grade9			*-0.245	0.015	-0.054
GPA			*0.200	0.010	0.069
Minority			*-0.126	0.019	-0.081

Note. *p<.016 (based on Bonferroni adjustment).

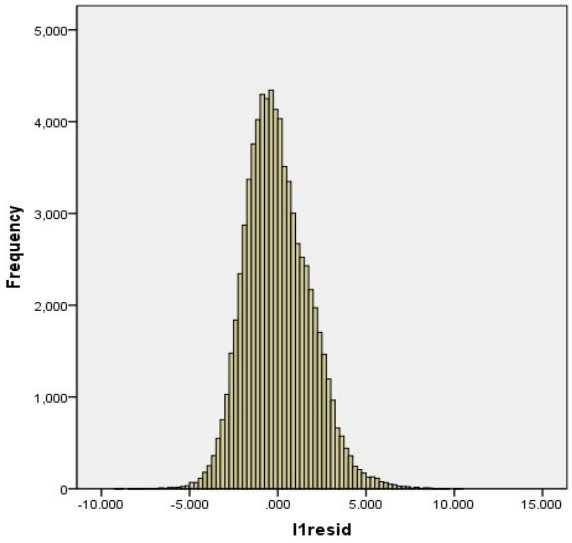

Figure 1. *Histogram of level-1 residuals (normality of u_{ij} assumption).*

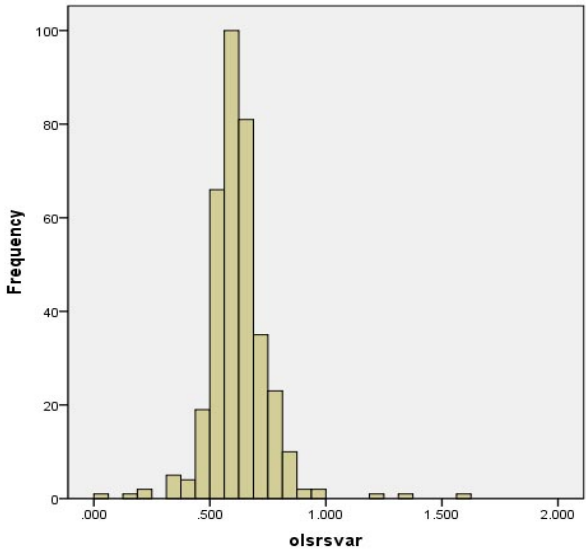

Figure 2. *Histogram of variance for level-1 homogeneity of variance assumption).*

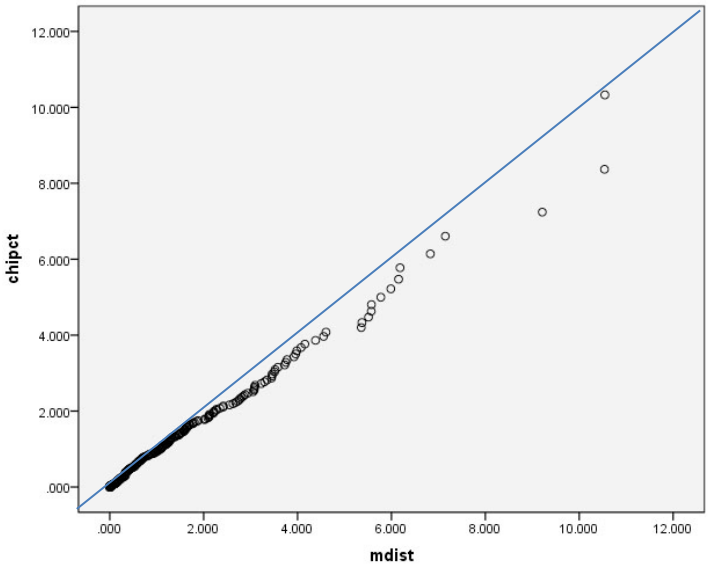

Figure 3. *Mahalanobis vs. expected values plot of level-2 residuals.*

Discussion and Implications

The HLM framework of the study suggests that there are student-level and school-level characteristics associated with the perception of SSC. Consistent with the Koth, Bradshaw, and Leaf (2008) multilevel study on perception of school climate, the results were consistent and the student-level accounts for the majority of the variation in SSC. Over one-fourth of the variance at the student level was explained by a few student characteristics, where most of the variance in SSC exists, but nearly three-fourths of the variance at the school level was explained, by similar school-level characteristics. This makes sense because the perceptions of SSC are student-level perceptions. However, Bronfenbrenner's (1994) ecological model speaks of the many indirect structures that are an important part of youth development. Because of the many indirect structures of influence, when investigating ways to increase the numbers of developmental assets among youth, looking at many different levels of influence is needed, as Koth et al. concluded.

From the data analysis, it suggests that diversity plays a role in students' perceived comfort and safety level within the school as measured by SSC. In fact, the effect of diversity is only slightly less than TCS, but negatively associated with SSC. Although students perceive a more positive school climate in a homogeneous school setting, it doesn't necessarily mean greater diversity causes a more negative school climate. It may indicate a lack of knowledge about the other cultural groups when there are more of them, leading to more uncertainty about school safety and climate. There are many educational opportunities in a setting with a diverse population and there are clear implications that these results should be used to emphasize the need for cultural integration to dispel this discomfort. Even in schools with a homogenous race population, there is still diversity in many other forms, for example GLBT, Special Education, etc. Students are different in many ways so learning to be comfortable around other students who are not the same is an additional asset. It will lead to more knowledge of the world and, as Nassar-McMillan et al. (2009) define it, greater cultural awareness and education will “promote enhanced learning and healthier facilitation of students’ cultural identity development processes” (p.18). This variable of racial diversity suggests that students may not understand other ethnicities and there can be interventions that can indirectly help students feel more positive towards more diverse climates.

Bullying is also negatively associated with students’ perceptions of school safety and climate. Surprisingly, the effect of bullying is slightly smaller than that of diversity. Along with the diversity variable, this is definitely saying that peer relationships need to be encouraged or maybe even taught since both bullying and diversity are associated in relatively strong manners to school safety and climate.

Teacher and community support seems to have the highest positive association, and strongest effect, with school climate at both the school level and at the individual level. When the teachers and school community are perceived to be supportive in the school, there is a positive association to school climate. When a student perceives support from teachers and the school community, students perceive more positive school climate. This supports the theories of positive youth development by Benson et al. (2006) and the ingredients of a healthy supportive school climate of Haynes et al. (1997) alike.

Understanding that the racial diversity of the school has a negative association with students' perceptions of SSC will allow schools to adjust related practices to improve this condition, not only regarding relationships between staff and students, but among students themselves. There also seems to be enough bullying in the schools for it to be statistically associated with SSC, so this should also be taken into account by schools to alleviate these relationships among students. Ultimately, the goal would be to create schools where students' bullying experiences are uniformly low, thus eliminating the association with SSC, and perhaps increasing SSC uniformly across schools.

In conclusion, the research only identifies some areas that can help make the perceptions of school climate more positive, but not specific ways to go about it. The hope for this research on school climate is to find ways to maximize students' positive learning environment. Because of this, further research is needed.

There were some limitations of this research. The survey itself was not designed to comprehensively measure developmental assets. That being the case, the measures obtained from the survey were not as strong in establishing measures of developmental assets as they could have been. Further research is still needed in this field. A more precise measure of GPA would

help in showing how school climate is associated with academic achievement. Haynes et al. found that a positive school climate is integral to the psychoeducational development and school adjustment of students. This means that the relations that students have in school have lasting impact on their academic success and future. A more reliable and precise measure of GPA may help quantitatively show the effects of school climate on academic achievement. Also, diversity is an interesting topic because there does not seem to be any consensus on how to define it quantitatively or qualitatively. In Nassar-McMillan et al.'s article, there seemed to be some disagreement between the teachers, parents, and schools about how to deal with culture and diversity. This disagreement will not help alleviate the negative association between diversity and student perception of SSC. Hopefully investigating other associations between school characteristics and the diversity index representing the racial demographic composition of the school can lead to better ways to measure diversity and understanding the role of school diversity.

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Appendix

Description of Variables

Variable	Description
Student Level	
FRL	Do you currently get free or reduced-priced lunch? Yes or No
TCS	Rasch score of 6 items for Teacher and Community Support
FS	Rasch score of 8 items for Family Support
B	Rasch score of 9 items for Bullying
SSC	Rasch score of 5 items for School Safety and Climate
Gender	Gender of the student
Grade9	Dummy variable of student being in grade 9
GPA	Self-reported grade
Race	5-category race variable
School Level	
School TCS	Aggregated Rasch score for students within school
School FS	Aggregated Rasch score for students within school
School B	Aggregated Rasch score for students within school
School FRL	Percent of free and reduced lunch students at the school
Prop Grade9	Proportion of 9th grade students in the school
School GPA	Aggregated average of student-level GPA
Diversity	Shannon Index for diversity in the school
Location	12 category variable location of the school