

## Examining the Relationship Between School Climate and Student Achievement

*Springfield R-XII Public Schools*

June 2006

### Research Questions:

- *What factors associated with school climate can be extracted from the MSIP Advance Questionnaires completed by:
 
  - Faculty
  - Parents
  - Students*
- *What is the relationship between school climate and student achievement?*
- *What interrelationships exist among school climate, student achievement and school size (i.e. average daily attendance)?*

### Background

School climate has long been the subject of interest for education stakeholders. Researchers suggest that the level of school climate is one factor that contributes to the variability in student achievement. In a review of the literature, Bulach, Malone, & Castelman (1995) cite seventeen references which support this relationship and in their own research found “significant differences in student achievement between schools with good school climate and those with a poor school climate.” (Bulach & Berry, 2002; p. 1). Other researchers have also noted that a positive school climate contributes to higher academic achievement (eg. Hirase, 2000; Erpelding, 1999).

Better understanding of the level of school climate within a building allows school administrators and faculty to identify areas of strength and focus on those that might need improvement. In order to identify the factors associated with school climate, Springfield Public Schools (SPS) in collaboration with Missouri State University’s Institute for School Improvement (ISI) developed a study to examine the Missouri School Improvement Plan (MSIP) Advance Questionnaires completed by teachers, parents and students in order to develop an index of school climate. Using this index the relationship between school climate and student achievement was examined using spring 2005 SPS Missouri Assessment Program (MAP) communication arts, mathematics and science scores. The following objectives were addressed by this study:

- Construction of an index of school climate using the district teacher responses on the MSIP Advance Questionnaire and exploration of the relationship of the index to student performance.
- Examination of the similarities and differences between student, parent, and teacher views of climate by utilizing parent and student responses to the MSIP Advance Questionnaire.
- Exploration of the interrelationships among school climate, student achievement and school size utilizing MSIP climate indices, MAP scores and average daily attendance.

This research brief summarizes the findings of the impact of school climate on student achievement and also lays the ground work for future examination of other (i.e. confounding) variables highly related to both climate and achievement, including school size. In addition to the relationship between school climate and student achievement, the interrelationships among climate, achievement and school size is explored utilizing average daily attendance as an indicator of size. However, additional examination of the intricate relationship among climate, achievement and size warrants further study.

## ***Faculty Climate Factors***

**Themes associated with the five factors extracted from the faculty MSIP survey:**

### **School Environment**

- Teachers are caring and available
- Expectations are attainable
- School is a safe place
- Children are treated fairly
- Learning is fun
- School's mission is clear

### **Parent Involvement**

- Information on achievement
- Support for student learner
- Clearly defined standards
- Shared standards
- School support for helping parents help students

### **Curriculum**

- Clearly defined
- Aligned with benchmarks
- Aligned with standards
- Supported via implementation

### **Community Support**

- School pride
- Involvement with school
- Community unity

### **Tech Support**

- Access to Internet
- Availability of other educational technologies
- Adequate financial support
- Adequate physical plant
- Adequate media support

## **Examining School Climate Factors**

### ***Faculty MSIP Advance Questionnaire***

In order to establish an index of school climate, the ISI research team conducted an exploratory factor analysis of the faculty MSIP Advance Questionnaire aggregated across all grade levels as completed by classroom teachers. The Advance Questionnaire includes ninety-six items. Principle Axis factoring was used to extract twelve factors, initially. The first five factors, were retained as the "prime" indicators associated with school climate. These five factors include: (1) School Environment, (2) Parent Involvement, (3) Curriculum, (4) Community Support and (5) Technology Support. These factors along with the related themes associated with items loading onto each are noted in the sidebars to the left.

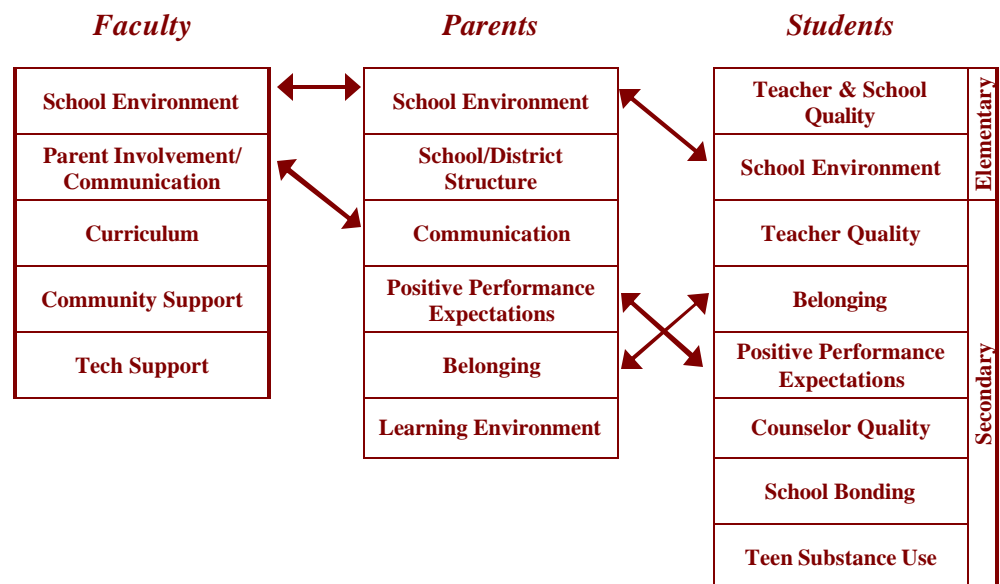
### ***Parent MSIP Advance Questionnaire***

The same steps were followed in extracting school climate factors from the parent MSIP Advance Questionnaire. This 46 item survey yielded six "prime" climate factors which include: (1) School Environment, (2) School/District Structure, (3) Communication, (4) Positive Performance Expectations, (5) Belonging, and (6) Learning Environment.

### ***Student MSIP Advance Questionnaire***

Again, school climate factors were extracted using data from the student (i.e. elementary and secondary) MSIP Advance Questionnaires. The elementary survey consists of 18 items and yielded two "prime" climate factors: (1) Teacher/School Quality and (2) School Environment. Items contained on the secondary survey (n = 51) yielded five "prime" factors: (1) Teacher Quality, (2) School Environment, (3) Positive Performance Expectations, (4) Counselor Quality, (5) School Bonding, and (6) Teen Substance Use.

## **Comparison of Climate Factors**



## Relationship Among Climate Factors

Parent reported school climate factor scores were highly correlated with teacher reported school climate factors. As shown in Table 1, four of the six Parent School Climate factors were significantly correlated with between four and five of the Teacher factors. The strongest relationships were among the School Environment, Partnerships, Parent Involvement and Communication factors. The remaining two Parent factors were significantly correlated with one to two Teacher factors.

Table 1  
*Correlations Between Parent and Teacher MSIP Factors*

Parent Factors	Teacher Factors				
	School Environment	Parent Involvement	Curriculum	Partnerships	Tech Support
School Environment	<b>.581**</b>	<b>.495**</b>	<b>.344*</b>	<b>.651**</b>	<b>.476**</b>
School/Dist. Structure	<b>.503**</b>	<b>.471**</b>	<b>.300*</b>	<b>.518**</b>	<b>.405**</b>
Communication	<b>.622**</b>	<b>.555**</b>	<b>.390**</b>	<b>.681**</b>	<b>.502**</b>
Positive Perf. Exp.	<b>.495**</b>	<b>.440**</b>	.259	<b>.544**</b>	<b>.373*</b>
Belonging	.245	.168	.061	<b>.595**</b>	.244
Learning Environment	.155	.096	.080	<b>.292*</b>	<b>.289*</b>

Note: N = 50; \* = correlations significant at the p<.05 level; \*\* = correlations significant at the p<.01 level.

Table 2  
*Correlations Between Parent and Secondary Student MSIP Factors*

Parent Factors	Secondary School Student Factors					
	Teacher Quality	Belonging	Positive Perf. Exp.	Counselor Quality	School Bonding	Teen Sub. Abuse
School Environment	<b>.757**</b>	<b>.753**</b>	<b>.701**</b>	.266	<b>.795**</b>	.494
School/Dist. Structure	<b>.649*</b>	.403	.506	.393	.386	.336
Communication	<b>.717**</b>	<b>.679**</b>	<b>.693**</b>	.127	.578*	<b>.666**</b>
Positive Perf. Exp.	<b>.660*</b>	.497	<b>.592*</b>	.255	.590*	.436
Belonging	.371	<b>.810**</b>	.283	-.316	<b>.761**</b>	.089
Learning Environment	.319	.389	.287	.288	.500	-.062

Note: N = 14; \* = correlations significant at the p<.05 level; \*\* = correlations significant at the p<.01 level.

As shown in Table 2, five of the six Parent factors were significantly correlated with up to four of the six Secondary Student factors. The strongest relationships were among School Environment, Communication, Teacher Quality, Belonging and Positive Performance Expectations. One Parent factor, Learning Environment, was not significantly correlated with any Parent factors. There was only one significant correlation between Teacher factors and Secondary Student factors (Table 3), between Teacher Partnerships and Secondary Student Belonging. Similarly, there was only one significant correlation among the Parent and Elementary student factors, between Parent School Environment and Elementary Student School Environment (Table 4).

## *Student Climate Factors*

Themes associated with the five factors extracted from the student MSIP survey:

### *Elementary*

#### • Teacher/School Quality

- Teachers care about me
- Teachers treat me with respect
- Teachers think I can learn
- My teachers are good teachers

#### School Environment

- Students are friendly
- I am treated fairly
- Students behave well

### *Secondary*

#### Teacher Quality

- Teachers make learning interesting
- Teachers care about me
- Teachers are organized
- My teachers are good teachers

#### Belonging

- I like going to this school
- A lot of teamwork in our community
- Community is a good place

#### Positive Performance Expectations

- My family believes I can learn
- My teachers think I can learn
- I'm encourage to do well on the MAP

#### Counselor Quality

- I can talk to the counselor

#### School Bonding

- I like going to this school

#### Teen Substance Abuse

- Most kids drink a lot
- Drugs are a problem

## Parent Climate Factors

Themes associated with the five factors extracted from the parent MSIP survey:

### School Environment

- My child's teacher is a good teacher
- Teachers treat children with respect
- My child has fun learning

### School/District Structure

- School has high expectations
- School board listens to parent concerns
- School plans for improving achievement

### Communication

- Can talk with child's teacher
- Welcome to discuss child's educational needs
- School encourages parents to be involved

### Positive Performance Expectations

- Believe child can do well
- School encourages my child to do well on the MAP
- Teachers think my child can learn

### Belonging

- A lot of teamwork in our community
- Community trusts each other

### Learning Environment

- Good place to learn
- Building in good condition

Table 3

Correlations Between Teacher and Secondary Student MSIP Factors

Teacher Factors	Secondary School Student Factors					
	Teacher Quality	Belonging	Positive Perf. Exp.	Counselor Quality	School Bonding	Teen Sub. Abuse
School Environment	.396	.025	.308	-.020	-.057	-.402
Parent Involvement	.258	-.117	.168	-.045	-.219	-.294
Curriculum	.170	-.236	.097	-.018	-.220	-.054
Partnerships	.398	<b>.559*</b>	.358	-.302	.403	-.419
Tech Support	.039	-.340	.067	.049	-.280	-.161

Note: N = 14; \* = correlations significant at the p<.05 level.

Table 4

Correlations Between Parent and Elementary Student MSIP Factors

Parent Factors	Elementary School Student Factors	
	Teacher and School Quality	School Environment
School Environment	.180	<b>.398*</b>
School/District Structure	.119	.321
Communication	.068	.277
Positive Perf. Exp.	.095	.253
Belonging	.017	.169
Learning Environment	.114	.283

Note: N = 36; \* = correlations significant at the p<.05 level.

Table 5

Correlations Between Teacher and Elementary Student MSIP Factors

Teacher Factors	Elementary School Student Factors	
	Teacher and School Quality	School Environment
School Environment	-.063	.323
Parent Involvement	-.072	.206
Curriculum	.046	.198
Partnerships	.042	.299
Tech Support	.111	.249

Note: N = 37; no correlations were significant at the p<.05 level.

Finally, there were no significant correlations among the Teacher factors and Elementary Student factors (Table 5). It is likely that the fewer and smaller correlations of Student factors with Parent and/or Teacher factors are due in large part to the fact that the MSIP Advance Questionnaire items on the Teacher and Parent forms are quite parallel in content, while they are not as parallel on the Student forms, particularly the Elementary Student Form. This suggests that the Parent and Teacher forms are likely measuring very similar constructs, supporting their construct validity. The very small number of significant correlations with both Elementary and Secondary Student factors suggests that those Advance Questionnaires are measuring different constructs than the Parent and Teacher questionnaires. It is important, then, that school climate data continue to include responses from all three groups: Teachers, Parents, and Students

**School Climate & Student Achievement**

**Teacher Climate Factors & Achievement**

Figure 1. Estimated Marginal Means of Teacher Reported School Environment Factor

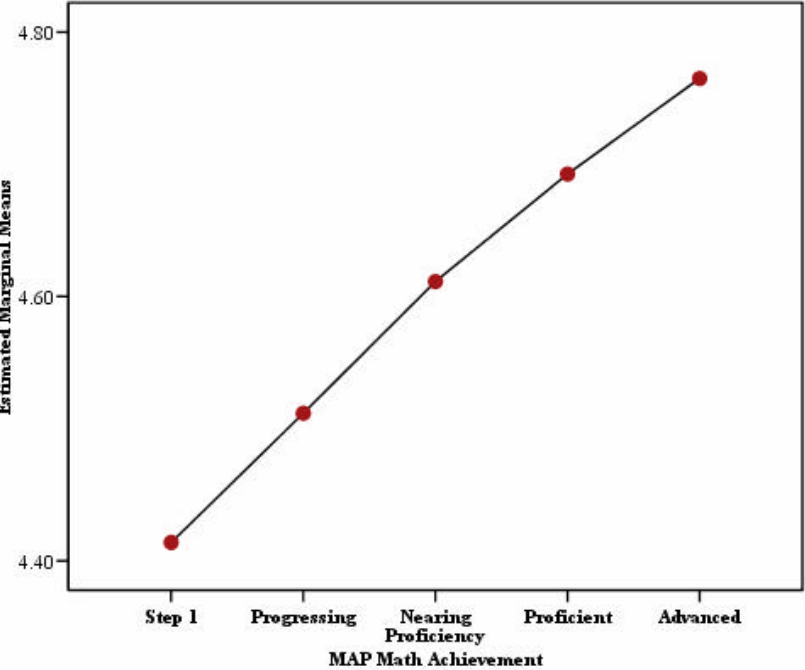


Figure 1 depicts a strong relationship between Teacher Reported School Environment and MAP Math Achievement. Students performing at higher levels on the Math MAP test were from schools with higher (more positive) School Environment mean values, as reported by Teachers.

Figure 2. Estimated Marginal Means of Teacher Reported School Environment Factor

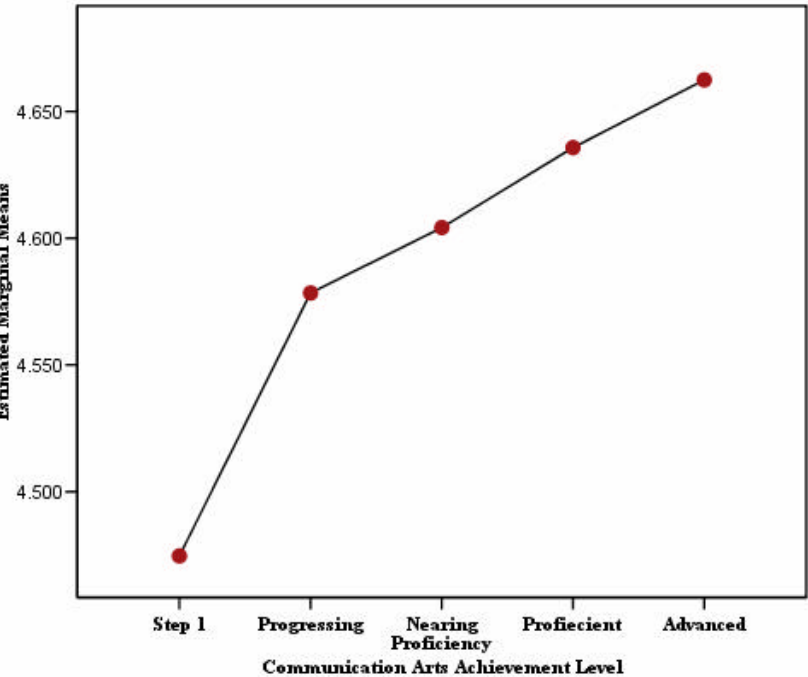
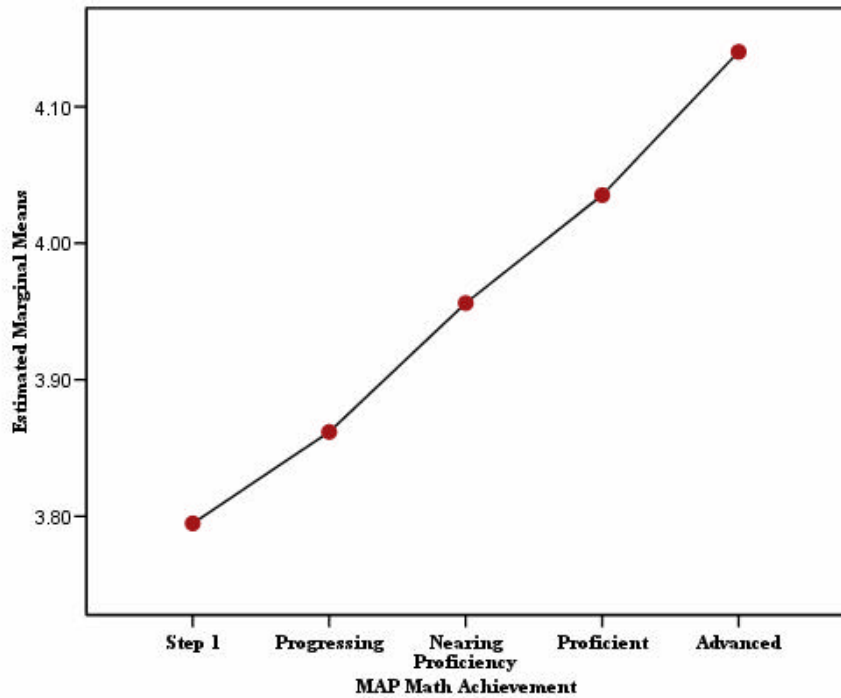


Figure 2 depicts a strong relationship between Teacher Reported School Environment and MAP Communication Arts Achievement. Students performing at higher levels on the Communication Arts MAP test were from schools with higher (more positive) School Environment mean values, as reported by Teachers.

## Parent Climate Factors & Achievement

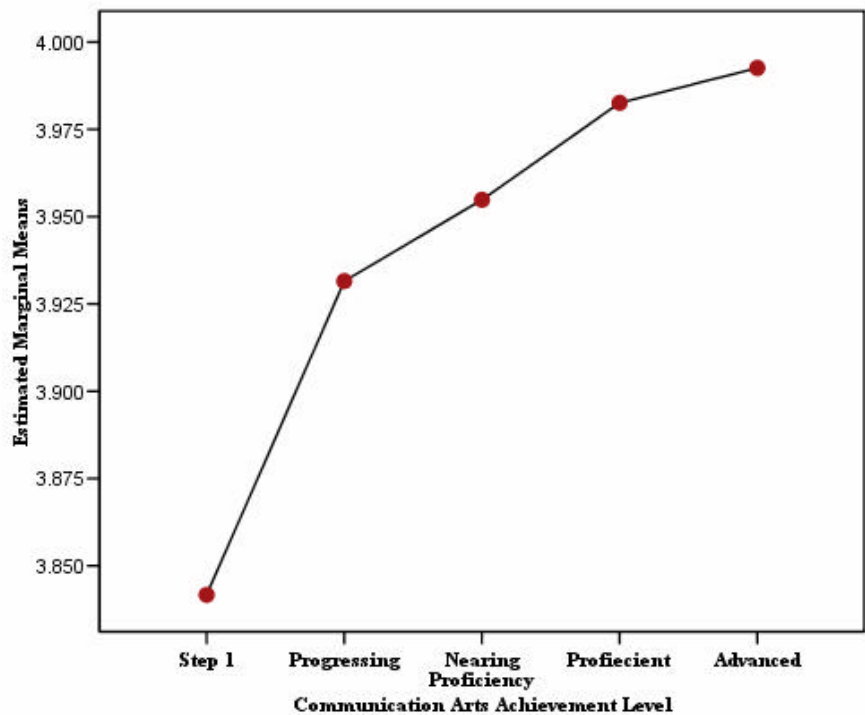
**Figure 3** depicts a strong relationship between Parent Reported School Environment and MAP Math Achievement. Students performing at higher levels on the Math MAP test were from schools with higher (more positive) School Environment mean values, as reported by Parents.

Figure 3. Estimated Marginal Means of Parent Reported School Environment Factor



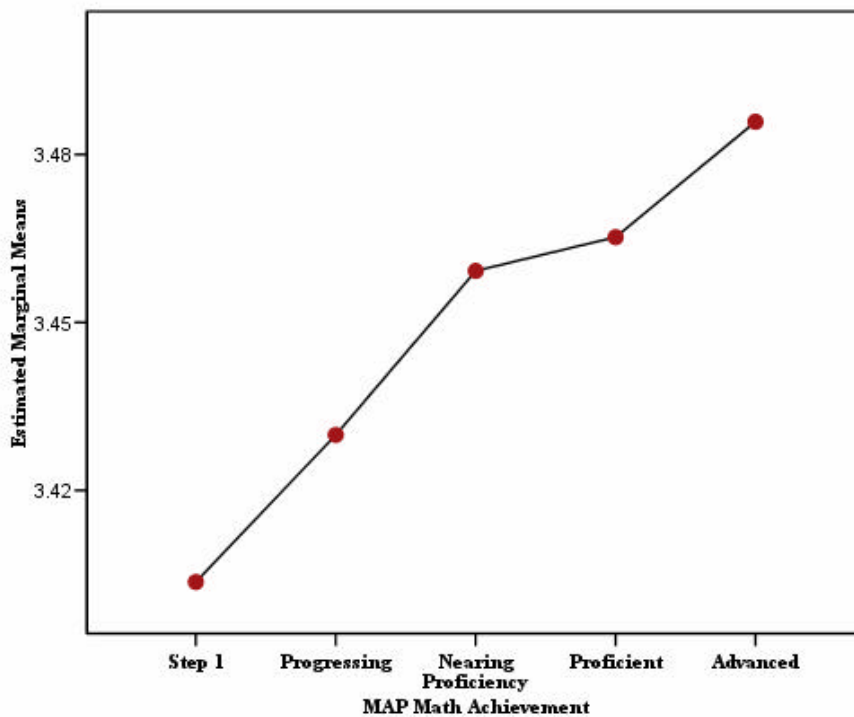
**Figure 4** depicts a strong relationship between Parent Reported School Environment and MAP Communication Arts Achievement. Students performing at higher levels on the Communication Arts MAP test were from schools with higher (more positive) School Environment mean values, as reported by Parents.

Figure 4. Estimated Marginal Means of Parent Reported School Environment Factor



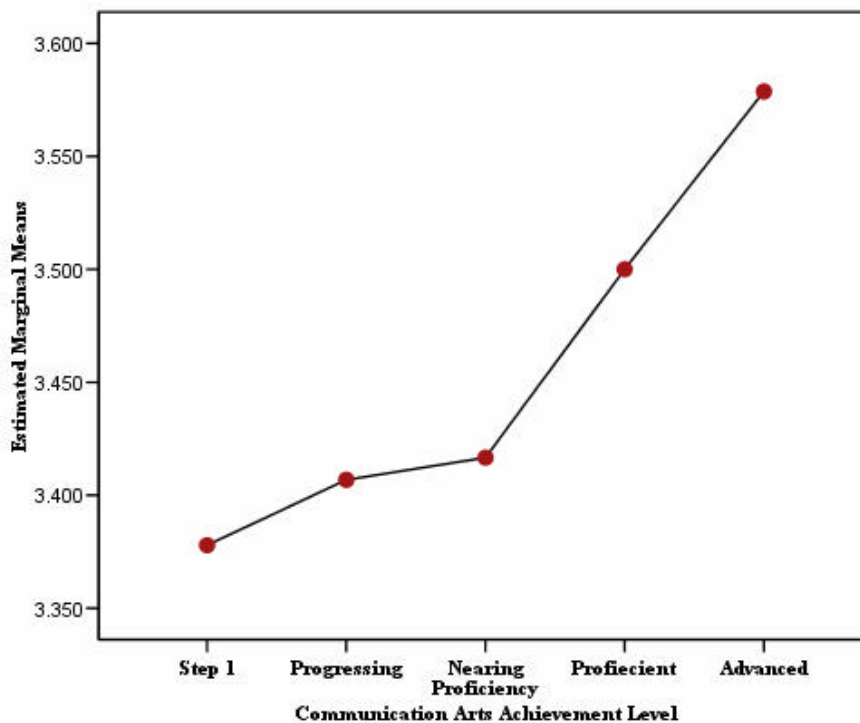
## ***Student Climate Factors & Achievement***

*Figure 5. Estimated Marginal Means of SEC Student Reported Belonging Factor*



*Figure 5 depicts a strong relationship between Student Reported Belonging and MAP Math Achievement. Students performing at higher levels on the Math MAP test were from schools with higher (more positive) Belonging mean values, as reported by Students.*

*Figure 6. Estimated Marginal Means of SEC Student Reported Belonging Factor*



*Figure 6 depicts a strong relationship between Student Reported Belonging and MAP Communication Arts Achievement. Students performing at higher levels on the Communication Arts MAI test were from schools with higher (more positive) Belonging mean values, as reported by Students.*

## Climate Index Scores

*Given the Factor Analysis and the MANCOVA results, it was decided to develop a method of calculating a School Climate Index score as a means of reporting to individual schools how their school climate factors looked on a common metric that would make comparisons more meaningful.*

*The chosen scale has a mean of 100 and a standard deviation of 15, corresponding to other scales that are familiar in educational settings.*

*Though not reported here, School Climate Index (SCI) scores were calculated for each participating school building*

Once these factors were obtained and determined to be valid indicators of school climate, multivariate analyses of covariance (MANCOVA) were conducted for each factor set (Teacher, Parent, Student) and each MAP Achievement Test (Math, Communication Arts, and Science). Mean school climate factor scores (computed as the sum of item responses) were used as the dependent variables, and MAP proficiency levels (Step 1, Progressing, Nearing Proficiency, Proficient and Advanced) were used as the independent variables. Student demographic variables (e.g., IEP Status, SES, Free/reduced lunch) were entered as covariates. The tables that follow illustrate significant results obtained from these MANCOVA's found to be statically significant.

Significant MANCOVA results were found for all five Teacher Climate factor scores on both Math and Communication Arts MAP levels (Table 6). In each instance, students achieving at higher levels on these MAP assessments were attending schools with more positive school climate mean factor scores, as perceived by teachers.

Table 6

*Teacher Climate Factors & Student Achievement: Results from a Multivariate Analysis of Covariance (MANCOVA)*

Teacher Factors	Climate Index --- MAP Scores		
	MAP Communication Arts Grades 3, 7, 11 n=3502	MAP Math Grades 4, 8, 10 n=5515	MAP Science Grade 10 n=692
School Environment	High---High	High---High	NS
Parent Involvement	High---High	High---High	NS
Curriculum	High---High	High---High	NS
Partnerships	High---High	High---High	High---High
Tech Support	High---High	High---High	NS

Note: NS = Not Significant

Table 7

*Parent Climate Factors & Student Achievement: Results from a Multivariate Analysis of Covariance (MANCOVA)*

Parent Factors	Climate Index --- MAP Scores		
	MAP Communication Arts Grades 3, 7, 11 n=3502	MAP Math Grades 4, 8, 10 n=5515	MAP Science Grade 10 n=692
School Environment	High---High	High---High	NS
School/Dist. Structure	High---High	High---High	NS
Communication	High---High	High---High	NS
Positive Perf. Exp.	High---High	High---High	High---Low
Belonging	High---High	High---High	NS
Learning Environment	High---High	High---High	NS

Note: NS = Not Significant

Significant MANCOVA results also were found for both Elementary Student Climate factor scores on both Math and Communication Arts MAP levels (Table 8). Students achieving at higher levels on these MAP assessments were attending schools with more positive school climate mean factor scores, as perceived by Elementary Students.

Significant MANCOVA results also were found for all six Secondary Student Climate factor scores on all Math MAP levels and on five of six Communication Arts MAP levels (Table 9). Students achieving at higher levels on these MAP assessments were attending schools with more positive school climate mean factor scores, as perceived by secondary students.

*Table 8  
Elementary Student Climate Factors & Student Achievement: Results from a Multivariate Analysis of Covariance (MANCOVA)*

ELE Student Factors	Climate Index --- MAP Scores		
	MAP Communication Arts Grades 3, 7, 11 n=3502	MAP Math Grades 4, 8, 10 n=5515	MAP Science Grade 10 n=692
Teacher/School Quality	High---High	High---High	NS
School Environment	High---High	High---High	NS

Note: NS = Not Significant

*Table 9  
Secondary Student Climate Factors & Student Achievement: Results from a Multivariate Analysis of Covariance (MANCOVA)*

SEC Student Factors	Climate Index --- MAP Scores		
	MAP Communication Arts Grades 3, 7, 11 n=3502	MAP Math Grades 4, 8, 10 n=5515	MAP Science Grade 10 n=692
Teacher/School Quality	High---High	High---High	NS
Belonging	High---High	High---High	NS
Positive Perf. Exp.	High---High	High---High	High---Low
Counselor Quality	High---High	High---High	High---Low
School Bonding	High---High	NS	NS
Substance Use	High---High	High---High	NS

Note: NS = Not Significant

On the MANCOVA's for Science MAP performance levels, results were either non-significant (15 of the means analyzed) or significant (three of the means analyzed) in ways that were opposite those found for other MAP tests. Since there were fewer than 700 secondary students who took the MAP Science test (compared with 3500 who took MAP Math and 5500 who took MAP Communication Arts), and a very skewed, non-normal distribution of Science score results, the obtained MANCOVA results be spurious. Therefore, we offer no conclusions about the relationships between school climate and Science achievement from these data.

*Statistically significant relationships were found between positive school climate and student achievement.*

*Multiple tests of school climate and Math and Communication Arts achievement outcomes strongly support a significant, broad relationship in which more positive school climate, across several factors, is associated with higher student performance levels.*

*Findings differ by school setting (i.e. elementary, middle, and high) and across disciplines (i.e. Communication Arts, Math, Science).*

## ***Achievement, Climate & School Size***

*School size (as reflected in ADA) is more of a mediating factor between MAP performance and school environment when it pertains to Math, to a somewhat lesser degree, Communication Arts, and not much of a mediating factor regarding MAP Science performance.*

*It appears that, overall, as school size increases, perceptions of school climate decline.*

*It appears that school climate alone has varying impacts on student performance, depending on the content area or discipline examined.*

## **Interrelationships Among School Climate, Achievement & Size**

The data displayed below reflect all schools across the district (elementary, middle, and high schools combined,  $n = 51$ ). With this in mind, it appears that school size (as reflected in ADA) is more of a mediating factor between MAP performance and school environment when it pertains to Math, to a somewhat lesser degree, Communication Arts, and not much of a mediating factor regarding MAP Science performance. Additionally, it appears that the larger the school, the better the MAP performance, particularly for MAP Math performance. However, this should be tempered, given the limited set of building-level data available. When middle schools and high schools were omitted from analyses, the effect of ADA was much more subtle with little effect. In order to understand more clearly the intricate relationship among school size, student achievement and school climate, examination of data at the student level is need to provide more detailed analyses. At the school level, larger schools may have higher MAP scores, but they also appear to have differing school climates measures when compared to other schools across the district.

Thus, it appears that, overall, as school size increases, school climate decreases. Since research indicates that school climate and student performance are positively related, we would expect larger schools (with lower climate scores) to have poorer student performance. These patterns were not found in the SPS dataset. It should be noted that this dataset was small in terms of number of schools studied, and that these results await validation with a larger dataset. In addition, it appears that school climate alone has varying impacts on student performance, depending on the content area or discipline examined. For instance, on the face of it, school climate appears to be fairly strongly inversely related to MAP Math performance (i.e., as school climate decreases, Math performance increases) and moderately negatively related to MAP Communication Arts performance, but positively related to MAP Science performance (i.e., as school climate increases, so does Science performance). Thus, these interrelations are complex and deserve further clarifying exploration.

*Table 10  
The Correlation Between School Climate and Student Achievement with Average Daily Attendance as the Indicator of School Size*

<b>Relational Pair</b>	<b>Correlation</b>
MAP Math X Climate	-.632
MAP Math X Climate (w/o ADA)	-.268
MAP Math X ADA	.794
MAP Comm Arts X Climate	-.309
MAP Comm Arts X Climate (w/o ADA)	-.118
MAP Comm Arts X ADA	.351
MAP Science X Climate	.566
MAP Science X Climate (w/o ADA)	.546
MAP Science X ADA	.382
Climate X ADA	-.638

## **Discussion & Recommendations**

The relationship between school climate and student achievement is substantiated empirically by the analysis of existing data provided by the Springfield R-XII Public Schools. While this relationship may be intuitive to some, it is important to note that the “direction” of the relationship should be the focus of follow-up research. That is to say we need to examine whether it is positive school climate that contributes to higher student achievement scores or higher student achievement scores that contribute to more positive school climate. Data examined and reported in this brief lead the researchers to believe that both associations are probably true but that school climate can be impacted directly by schools and, therefore, can be addressed by schools, effecting higher student achievement. Certainly, schools are encouraged to focus their efforts on factors they can influence rather than dwell on those they cannot. Figures 1 – 6 in this brief graphically display these associations across the three groups that provided school climate data, i.e., students, parents, and teachers; and further delineated between elementary and secondary settings.

The index of school climate developed by the research team for this study is a major contribution to the existing body of knowledge. Understanding the constructs identified here, i.e., school environment, school structure, communication, positive performance expectations, belonging, and learning environment will enable schools to develop policies and concentrate programs in areas that can lead to improved student achievement. These constructs can be examined, discussed, and addressed by any school / district seeking ways to improve school climate.

Differences in perceptions among students, parents, and teachers are confirmed here, as well, and were found to be consistent with other findings in the research literature. Perceptual differences between elementary and secondary groups of stakeholders were also found to be consistent with other findings.

The next step in the research plan is two-fold: (1) to include more schools / districts in a follow-up to this study, so a larger sample can be examined using a structural equation model (SEM) and hierarchical linear modeling (HLM) to determine the paths of relationships of school climate and student outcomes, including but not limited to achievement; and (2) to examine additional intervening variables such as teacher factors and instructional strategies, for example, to determine the relative strength of each variable’s impact on student achievement. This will enable schools to determine where the greatest amount of human and fiscal resources might be directed to produce the most desirable outcomes.

## **References**

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## ***The Institute for School Improvement***

The Institute for School Improvement (ISI) at Missouri State University is charged with supervising a number of professional development programs for school administrators, faculty and staff. ISI staff, project investigators, and research assistants conduct research and program evaluations and develop special projects that connect communities with schools. ISI publishes an annual report, along with periodic policy briefs, research summaries, and a variety of statistical reports and program evaluations. As a University “umbrella” organization to manage, supervise, and administer a number of grants and contracts, ISI initiatives contribute to the Missouri State University statewide mission in Public Affairs. ISI staff work collaboratively with University and community partners to support a number of projects tied to the mission of linking theory to practice.

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