Abstract

This paper seeks to explore the relationship between a school improvement and effectiveness treatment, the Instructional Practices Inventory (IPI), with school climate and achievement levels within a large Mid-West Public School System (MWPSS). At time of IPI introduction within MWPSS, 87,000 students were enrolled in the district, educated by some 6,100 full and part-time faculty. The MWPSS district represents an especially compelling case study as 125 of the 223 schools adopted the IPI and collected student engagement observational data using the IPI protocol. Accordingly, student engagement data collected from uniformly-conduced classroom observations enables the researcher to study 56% of public schools within a large urban district that attempted to alter its instructional practices to foster heightened levels of active, higher-order student engagement levels in hopes of bolstering both the quality of instructional provision and standardized achievement levels.

The study yielded surprisingly finding on several dimensions. More specifically, a negative relationship between school climate survey results and student achievement levels were consistently demonstrated across SEM models, while a consistent trend of positive correlational relationships between school-level inputs and climate emerged. Additionally, these school inputs, while demonstrated by the literature to evidence a heavily deleterious impact on standardized achievement, were indeed found to be extremely negatively correlated in the present study. These school inputs' effects on student engagement levels, while remarkable, were less so than with student achievement levels. Finally, the relationship between lower-order thinking and student achievement exhibited a negative correlational relationship that was considerably more elevated than the positive relationship found to exist between higher-order thinking and student achievement levels.

Introduction

Building Level Processes and Institutional Refinement

The current organizational learning research largely focuses on decision-making and choice. (Bontis, et al, 2002). The more dated, yet seminal work of authors such as Herbert Simon (1952) suggest that "there are a great many things that can be said about organization in

general, without specification of the particular kind of organization under consideration" (p. 1130). This contention appears to hold true for schools, which are institutions not unlike the many other organizations studied in organizational analysis and learning. As such, a consideration of the literature on organizational learning in the private sector can prove to be useful for school settings, as well. The appropriate processes and structures for exacting organizational learning and change demand more than robotic routines based on organizational information. Instead, argue Fiol & Lyles (1985), "organizations can be designed to encourage learning and reflective action-taking, but this generally means moving away from mechanistic structures" (p. 805). Organizations that are able to enact more effective operational practices warrant study of these organizational learning efforts that yield such favorable results.

Evaluation, Innovation, and Task Devolution in the No Child Left Behind Era

Considering the complex interrelationships between student achievement and engagement levels with school inputs and practices and processes must be supplemented with a broader contextual background. School in the No Child Left Behind accountability era are expected to do far more with considerably less. Rouse, Hannaway, Goldhaber, and Figlio (2007) studied the instructional policies and practices resulting from the national school accountability push. Rouse et al. (2007) did find some evidence of meaningful and constructive changes in schools as a result of such pressure. Rouse et al. (2007) indicated that "there has been little systematic effort to determine the substantive ways in which schools alter their methods of delivering education in response to school accountability and school choice pressures" (p. 3). The very act of school leaders taking the initiative to incorporate the IPI suggests their active dedication to represent the accountability movement's call to educational excellence. Were the IPI to represent a cost-effective, substantive solution to address the pressures that can hamper school effectiveness, questions of school leaders' motivations to apply such an initiative out of sheer survival, as opposed to a dedication to excellence, would warrant consideration. Rouse et al. (2007) write about such competing cost-mission considerations, as "economic theory would suggest that school superintendents, principals, and teachers can produce education more effectively by using a different mix of inputs; by selecting a different mix of policies. However, why school administrators would have an incentive to make sure improvements is less clear" (p. 10). It should also be remembered that being labeled "low-performing school" brings with it increased oversight and bureaucratic obstacles (Rouse et al., 2007). Rouse et al. (2007) mention incentives that are not expressly economic in nature or easily quantifiable, but are nevertheless powerful. The concept of "identity utility," for instance, in which teachers feel attached to, and directly responsible for, the performance and status of their school is a concept worthy of consideration in school improvement and effectiveness initiatives. A school's faculty can become greatly impacted by the social stigma associated with a "failing schools" designation. Similarly, an underlying consideration for this study, as gleaned by receptivity and integrity metrics of IPI implementation, is the extent to which school leaders decide to undertake the IPI or similar instructional initiatives as the faculties strive for meaningful and impactful change within their buildings. More specifically, if it is the case that schools adopt the IPI out of a sense of professional mission, the accountability pressures of the high-stakes testing era may simply

represent a latent motivational impetus, leaving the potential for meaningful change more promising.

Rouse et al. (2007) constructed and administered surveys to school leaders that questioned principals' policies and resource expenditures. The schools labeled failing, according to the findings of the Rouse et al. (2007) study, improved faster than similar schools with higher status designations. Rouse et al. (2007)'s findings suggest that "…when faced with increased stigma, oversight, and the threat of vouchers, student outcomes can improve" (p. 25). achievement levels (as tested in the SEM models) become the logical variable of interest to establish in this or any school effectiveness study. The extent to which organizational improvement initiatives exhibit an influence on the desirable student achievement outcomes is of irrepressible interest to researchers, policymakers, and the wider public. Presumably school leaders first establish instructional goals and then enact internal organizational change initiatives to guide such organizational goals and processes. Rouse et al. (2007) found, for instance, that most schools attempted to organize teachers into teams or tried to schedule enhanced planning periods for teacher collaboration opportunities (p. 27). Rouse et al. (2007) write that "given the centrality of teachers to the learning process, it is not surprising that schools employ a variety of strategies to improve the performance of teachers" (p. 28). The very essence of the IPI can be captured by such considerations, as encouraging teachers to revisit, refine, and then re-enact the processes learned in the IPI training sessions and subsequent faculty meetings represents the underlying mission of this particular instructional treatment.

The extent to which teachers are empowered and act with autonomy, as evidenced by multiple IPI survey question responses, will serve as the metric of organization-wide dedication to enabling the advancement of the institutional mission. The importance that a school's faculty and administrative team assigns to the IPI, as it relates to the school's organizational goals, is highly relevant to both building level outcomes and internal accountability oversight at the district level. While an empowered and aggressive principal need not stifle faculty influence and input, it is important to consider whether the two actors behave in a fashion that is complementary to one another. Interestingly, Rouse et al. (2007) found that failing schools "engaged in systematically different changes in instructional policies and practices as a consequence of school accountability pressure, and that these policy changes may explain a significant share of test score improvements' (p. 35). Hence, simply because schools are low-performing does not disqualify them from potentially benefitting, and appreciably so, from the IPI incorporation. The fidelity with school faculty evidence adherence to the IPI tenets, and the extent to which they simultaneously respond constructively to external accountability pressures are presumed to be highly impactful considerations, as well.

Donovan et al. (2006) document the many unintended consequences associated with accountability pressures. These authors also found evidence to suggest that student outcomes in lower level performing schools were enhanced as a result of school accountability pressures. Of concern to the authors was the prospect of school leaders abandoning their focus on higher-performing students, signaling to students that the educational end, test performance, trumps the means, the year-long process of learning. This presents the question of whether organizational learning can become detrimental to the public school environment, as school leaders become unduly influenced by bottom line results to the extent that best practices are suspended.

An Elaborate Methodology for an Exacting Research Challenge

It becomes imperative that these school leaders consider not just student outcomes, but that they also establish school level processes (captured by engagement levels and survey processes) as designated outcomes for the school, as well (as identified dependent variables). Donovan et al. (2006) further found that schools no longer threatened by accountability standards did not demonstrate achievement gains subsequent to the sanctions being lifted. Schools, like any organization, can encounter a mission drift not in the scope of their educational operations, but rather its nature: school leaders must remain focused on effectively educating children, a tenet which serves as the cornerstone of the IPI process, and a principle that is sought to be tested in the various SEM models.

The proposed statistical methods in the present study provide many benefits to the research community. The statistical methodology that is adopted to accommodate these building-level practices addressed by the study's several research questions are guided by theoretical underpinnings that are sound and salient. The research questions themselves, believed to be highly important components of school improvement and effectiveness initiatives, encouraged a methodological research design which would yield veracious and illustrative quantifiable answers to these highly complex and multidimensional research questions. Structural Equation Modeling represents one such methodology that can accommodate the scope and breadth of these research questions. Simply employing a sophisticated and complex technique is, alone, insufficient to ensure that such research questions are properly addressed. Indeed, complex SEM models, when haphazardly constructed, and employed can produce meaningless, or worse yet, deceptive results.

Guo, Perron, and Gillespie's (2008) review of Structural Equation Modeling (SEM) studies proves useful in further developing this relatively new methodology. These authors examined 32 SEM studies from 2001 to 2007. Guo, Perron, and Gillespie (2008) suggest, and the researcher acknowledges, that "taking stock of research in a particular area of research is necessary to ensure a high standard of quality research and publications" (p. 2). The authors found that the current SEM research, and the reporting of the resulting computational output therein, have been demonstrated to be deficient and "not aligned with various best practices recommended by SEM experts." Citing a further deficiency, Guo, Perron, and Gillespie (2008) note that only 15.6 % of studies considered employed a competing models approach, or used different first and second level ordering configurations. Sample sizes across the study's population sample were found to range between 120 and 6424. Furthermore, 34.4 percent of studies included two to three latent indicators per latent variable. One such conventionally-employed practice is to drop items in the event that they possessed factor loadings less than .60, a practice believed to be inadvisable for the present study. Guo, Perron, and Gillespie (2008) remind the researcher, however, that "valid and reliable research results depend on a method appropriate to the research problem and on that method being used correctly" (p. 15). It is in such a spirit that any post-hoc manipulation of the statistical models that were included in the present study are entirely grounded in a theoretically justifiable rationale rather than out of sheer expediency to attain more promising model fit results.

Hoe (2008) writes that SEM is "more versatile than other multivariate techniques because it allows for simultaneous, multiple dependent relationships between variables" (p. 77). Hoe (2008) also cites the commonly noted rule of thumb that 10 population cases should exist for every free parameter estimated in the SEM model. Hoe (2008) notes that "a chi-squared d.f.

ratio of 3 or less is a reasonably good indicator of model fit" (p. 78). These documented metrics were given active consideration in the SEM models employed in this study.

When properly constructed, Born, Wen, and Lin (2007) note that "the employment of SEM can identify the interdependence and causality relationship between the unobserved variables and the observed variables" (p. 6). While considering the many unobserved phenomenon that are highly important to school effectiveness efforts, it is also the case that student engagement-related data that are entirely unobservable are not squarely located in a singular organizational level or location.

The IPI in the Heightened Accountability Era

Perhaps at no other time in the history of United States public education have school systems mirrored the private sector in terms of accountability for bottom line results to such an indistinguishable extent. Standardized test performance levels represent the final product to be "manufactured by" the schools in the accountability era. The IPI was designed to be an informative rather than an evaluative tool. As "many school districts also conduct their performance evaluations," (Willms, 1999, p. 473), school leaders are quite accustomed to such practices, but may view the IPI as just another punitive measure. Indeed, it becomes especially important to remember that the IPI is not a process that can be readily and appropriately incorporated within schools in a one-size-fit all fashion. Such a consideration also addresses the essence of the IPI and the rationale of the present study: simply adopting a school improvement mechanism to monitor and better organizations is of little benefit if these instructional treatments are not widely, and at least somewhat warmly, embraced. Hence, change initiatives that are incorporated within educational settings, but are not effective in accomplishing their desired effects, may be highly dependent on the organizational practices within schools. Ultimately, the IPI offers the appropriate instructional supports that are needed by schools whose faculties may possess certain deficiencies in their skills sets, be they pedagogical or otherwise.

Research Questions:

The study will seek to address the following research questions:

1) What is the relationship between School Climate Survey responses and the student engagement and student achievement levels within schools across the MWPSS district?

2) What is the relationship between student engagement levels within MWPSS schools and the standardized test performance of their students?

3) What is the relationship between school level variables, demonstrated to be impactful on student achievement and engagement, with standardized test performance and student engagement levels across MWPSS?

Quantitative Methods

Survey Research Instrumentation

The School Climate Survey

Staff survey responses from 6489 survey respondents were used. 65% of these survey respondents were classroom teachers. The climate survey solicits respondents to respondent to questions related to school safety, environment, governance and academic rigor. The survey respondents assign designated ordinal responses to survey questions on a four point scale which is as follows:

4) Strongly Agree

3) Agree

2) Disagree

1) Strongly Disagree.

Sample questions under each of the four categories can be found in the appendix at the end of the paper.

Methods

The IPI Instrumentation

The Instructional Practices Inventory (IPI) is a process employed by classroom observers to ascertain the nature of student engagement across classrooms within a school. The IPI is comprised of "a set of observational categories complex enough to provide substantive data grounded in the knowledge of best practice (valid) yet easily understood and interpreted" (Valentine, 2007). The IPI instrumentation allows a trained classroom observer to collect scores of observational codes that capture student engagement behaviors for each school. The observation categories included in the IPI observation protocol are: (1) student disengagement, (2) student engagement in non-higher order activity without teacher participation, (3) student engagement in non-higher order activity with teacher support, (4) teacher-directed instruction,

(5) student engagement in higher-order classroom discussion, and (6) all other higher-order student learning.

The IPI process focuses on student engagement and cognitive thinking rather than teacher or student behavior. The IPI profile data can be used to foster teacher engagement in whole-faculty and small-group collaborative analysis, reflection, and decision-making of the profile data. The IPI instrumentation, and the accompanying building-level instructional processes, can ultimately provide telling and comprehensive school-wide data that allow teachers and administrators to continuously monitor and refine their pedagogical practices. These components of the IPI process support continuous change and collectively foster organizational learning (Valentine, 2007).

Undoubtedly there exists a multitude of factors whose impact on student learning are noteworthy. This exploratory study was designed to glean the extent to which student engagement levels may or may not lead to demonstrable gains in standardized achievement performance of public school students. The study is constructed in a manner whereby the researcher is able not only to offer dichotomous "yes/no" conclusions about such a relationship, but also to expound on the magnitude with which different forms of student engagement ultimately impact students' abilities to perform at or above the proficiency levels of the Missouri Assessment Program (MAP) standardized tests.

One of the more complex methodological challenges presented by the present study is not formulaic in nature, but rather involves the adequate and accurate definition of student engagement levels and what constitutes higher and lower ordering thinking. Such attempts to delineate meaningfully nuanced distinctions between various types of student engagement can quickly become obscured and fruitless if student engagement behaviors are hyper-parsed, and categorized as such. The Instructional Practices Inventory strikes a methodologically appropriate balance between meaningfully categorizing student engagement categories without deconstructing the classroom environment to such an extent that coding the minutia of student behavior becomes an untenable task for the classroom observer. More importantly, as the categories become more numerous (and indistinguishable), the reliability of such classroom observations can become greatly diminished. With this in mind, the Instructional Practices Inventory categorizes student engagement levels on a continuum from 1 to 6, which is designed to account for the spectrum of student engagement that one can expect to find in any given classroom at a particular moment.

Table One offers an explanation of each of the six coding categories. It is important to note that while the higher-order categories ("5" and "6") represent desirable forms of student learning whereas the lower-order categories ("1" and "2") represent less effective and generally undesirable, indefensible forms of student activity within classrooms, it is not always possible, nor desirable, for students to be engaged solely in higher-order activities. As such, categories "3" and "4" account for those moments during classroom instructional time when the teacher is

primarily involved in informing and directing the students' activities in the classroom, as student engagement becomes mostly passive and inactive. This might come in the form of teachers informing students of certain tasks or logistical considerations or teacher-directed learning, both of which are inevitable components of effective teacher pedagogy and student learning.

Table One: *Instructional Practices Inventory Category Descriptions*

Broad Categories	Coding Categories	Common Observer "Look-Fors"
Student-Engaged Instruction	Student Active Engaged Learning (6)	Students are engaged in higher-order, deeper learning that does not involve student-to-student discussions. Knowledge of deeper understanding independently rather than verbally is evidenced.
	Student Learning Conversations (5)	Students are engaged in higher-order learning conversations. They are constructing knowledge or deeper understanding as a result of the conversations.
Teacher-Directed Instruction	Teacher-Led Instruction (4)	Students are attentive to teacher-led learning experiences such as teacher explanations, directions, admonishments, and media instruction with teacher interaction. Discussion may occur, but instruction and ideas come primarily from the teacher. Higher order learning is not evident.
	Student Work with Teacher Engaged (3)	Students are doing seatwork, working on worksheets, book work, tests, "skill-and-drill" recitations, video with teacher viewing the video with the students, etc. Teacher assistance, support, or attentiveness to the students is evident. Higher-order learning is not evident.

Disengagement	Student Work with Teacher not Engaged (2)	Students are doing seatwork, working on worksheets, book work, tests, skill practice video without teacher support, etc. Teacher assistance, support, or attentiveness to the students is not evident. Higher-order learning is not evident.
	Complete Disengagement (1)	Students are not engaged in learning directly related to the curriculum.

(Valentine, 2007)

Survey Research Instrumentation: The School Culture Survey

Research studies using the School Culture Survey (SCS) have documented the relationships between the factors of the SCS and numerous other school effectiveness/improvement variables such as the instructional and transformational leadership of school principals (Gawerecki, 2003; Gruenert, 1998; Lucas, 2001; Maher, 2000; Miles, 2002), school climate (Gruenert, 1998), and teacher empowerment (Maher, 2000). The School Culture Survey (SCS) informed the study by providing data about school culture (Gruenert, 1998). The six factors of the SCS are identified as: (1) Collaborative Leadership, (2) Teacher Collaboration, (3) Professional Development, (4) Unity of Purpose, (5) Collegial Support, and (6) Learning Partnership.

The SCS consists of 35 Likert-type questions with the following six accompanying response options to be selected by the survey respondents: “strongly disagree,” “disagree,” “somewhat disagree,” “somewhat agree,” “agree,” and “strongly agree.” The six SCS factors that comprise the SCS all employ this scale. Simply put, the higher the score that the respondents assigned to the respective factors of the SCS, the greater was the respondents’ affirming the presence of the factors within their respective schools.

The SCS was used to collect data about the perceived artifacts associated with an effective school culture (Gruenert, 1998; Gruenert & Valentine, 1998). The School Organizational Climate Description Questionnaire-Revised Middle (SOCDQ) (Hoy & Sabo, 1998) and the Organizational Health Inventory-Middle (OHI) (Hoy & Sabo, 1998) were the primary school climate instruments incorporated within the study. The Staff Assessment Questionnaire (Andrews & Soder, 1987) and the School Participant Empowerment Scale (Short & Rinehart, 1992) were also used to collect teacher’s perceptions about the factors that will ultimately provide a means by which to explore school culture and climate interrelationships.

An analysis of the data associated with the SCS reveals whether differences in the pre and post mean scores for the five SCS culture variables were significant: teacher collaboration, unity of purpose, professional development, collegial support, and learning partnership. The "teacher collaboration" items measure the degree to which "teachers engage in constructive dialogue that furthers the educational vision of the school" (Gruenert & Valentine, 1998) and reflects changes in the way teachers across the school work and plan together, analyze, and build an awareness of the practices and programs used by others throughout the school.

Understanding the school's common mission and efforts to accomplish that objective was analyzed by the "Unity of Purpose" variable. The "Professional Development" variable describes the degree to which teachers "value continuous personal development and school-wide improvement" Gruenert & Valentine, 1998). The degree to which teachers work together effectively, trust each other, value each other's ideas, and assist each other in their work toward the tasks of the school organization was measured by the "Collegial Support" variable. Additionally, the "Learning Partnership" variable of the SCS, which describes how well teachers, parents, and students share and communicate a common expectations for student success was also tested within several measurement models.

Hoy's School Organizational Climate Description Questionnaire (OCDQ) constituted various sections of the SCS. Hoy identifies six dimensions of the OCDQ and provides additional explanations of each subset.

Supportive principal behavior is directed toward both the social needs and task achievement of faculty. The principal is helpful, genuinely concerned with teachers, and attempts to motivate by using constructive criticism and by setting an example through hard work.

Directive principal behavior is rigid domineering behavior. The principal maintains close and constant monitoring over virtually all aspects of teacher behavior in the school.

Restrictive principal behavior is behavior that hinders rather than facilitates teacher work. The principal burdens teachers with paperwork, committee requirements, and other demands that interfere with their teaching responsibilities.

Collegial teacher behavior supports open and professional interactions among teachers. Teachers like, respect, and help one another both professionally and personally.

Committed teacher behavior is directed toward helping students to develop both socially and intellectually. Teachers work extra hard to insure student success in school.

Disengaged teacher behavior signifies a lack of meaning and focus to professional activities. Teachers simply are putting in their time; in fact, they are critical and unaccepting of their colleagues. *(Source: Wayne Hoy Personal Website)*

Features of Hoy's Organizational Health Inventory (OHI) for Middle Schools were also incorporated into the study to glean the extent to which the wider organizational integrity of the school is evidenced from a battery of questions that probe organizational health. Hoy defines healthy schools as educational settings "in which the institutional, administrative, and teacher levels are in harmony; and the school meets functional needs as it successfully copes with disruptive external forces and directs its energies toward its mission" (Hoy Website). Hoy provides definitions for the seven subsets he has identified as undergirding the OHI instrumentation:

Institutional Integrity is the degree to which the school can cope with its environment in a way that maintains the educational integrity of its programs. Teachers are protected from unreasonable community and parental demands.

Collegial Leadership is principal behavior that is friendly, supportive, open, and guided by norms of equality. But, at the same time, the principal sets the tone for high performance by letting people know what is expected of them.

Consideration is principal behavior that is friendly, supportive, and collegial. The principal looks out for the welfare of faculty members and is open to their suggestions.

Principal Influence is the principal's ability to influence the actions of superiors. Influential principals are persuasive with superiors, get additional consideration, and proceed relatively unimpeded by the hierarchy.

Resource Support is the extent to which classroom supplies and instructional materials are readily available; in fact, even extra materials are supplied if requested.

Teacher Affiliation is a sense of friendliness and strong affiliation with the school. Teachers feel good about each other, their job, and their students. They are committed to both their students and their colleagues and accomplish their jobs with enthusiasm.

Academic Emphasis is the extent to which the school is driven by a quest for academic excellence. High but achievable academic goals are set for students; the learning environment is orderly and serious; teachers believe in their students' ability to achieve; students work hard and respect those who do well academically.

(Source: Wayne Hoy Personal Website)

Structural Equation Modeling

Structural Equation Modeling represents a statistical methodology that can accommodate the scope and breadth of the above-listed research questions. Simply employing a sophisticated and complex technique is, alone, insufficient to ensure that such research questions are properly addressed. A cautionary note is in order, however, as complex SEM models, when haphazardly constructed, and employed, can produce meaningless, or worse yet, deceptive results. Structural Equation Modeling was employed in the study for two principal reasons: (1) to measure the

many phenomena associated with school culture and effectiveness undertakings that are not readily observable and neatly aggregated into measurable and quantifiable constructs; (2) to offer a methodological means upon which to compare, corroborate, and refine the school culture findings from the SCS and similar instruments that employ more rudimentary correlation and regression analyses.

SEM, and the LISREL 8.8 software that performs such modeling, enables for relational interactions to be considered not simply in pictorial form, but in a manner that allows for guarded causal postulations to be advanced. While the methodology itself may be of little interest to school leaders or policymakers, the interactions of the many complex and oftentimes confounding building level variables may prove to be of far greater salience to such an audience.

The statistical relationship between the cultural underpinnings of a school, as measured by the latent factors constructed within the SEM models, as well as on the measurable survey items on the School Culture Survey, can offer an insightful investigation of the interplay between the more mechanical processes of school effectiveness efforts with the more humanistic attempts to include and empower the wider faculty. These latent factors were subjected to Structural Equation Modeling (SEM) to determine if such factors were directly correlated with, and mutually influential upon, one another. LISREL 8.8 software was employed to perform path analysis on basic measurement models in an effort to determine whether the relationships between the latent and measurable variables were sufficiently strong to enable causal inferences to be postulated with respect to whether the measurable, observed, and prescribed IPI practices directly affected those more imperceptible latent factors.

The import of the SEM methodology for the purposes of the present study involves its statistical power, which enables the researcher to infer causal relationships while testing the relationship of variables to one another simultaneously, as opposed to running multiple analyses (Byrne, 1998; Conley, Muncey, & You, 2005; Kline, 2005). The latent factors in the SEM model included instructional practices (“Practice”), faculty teaming practices (“Teaming”), the rigor of academic and professional standards (“Rigor”) and the efficacious of school practices and processes (“Efficacy”). These latent factors are linked to measurable indicators that include multiple School Culture Survey (SCS) questions designed to enable the researcher to quantitatively glean information about school the schools culture, and the educational processes and practices at the building level.

Structural Equation Modeling enables the researcher to empirically capture the extent to which measurable indicators, defined as observable and readily quantifiable variables, are associated with (or “loaded onto”) proposed latent constructs. Such latent constructs cannot be directly quantified, and are, therefore, researcher-generated constructs. The association and influence that such latent constructs exhibited on one another is of interest to the educational research community, as certain site-level phenomena within schools are not directly observable. Hence, the allure of Structural Equation Modeling can be quite desirable, as methodologically

accounting for that which is not easily captured by direct measurement or quantification by employing a path analysis of such models represents a highly desirable statistical enterprise (Byrne, 1998; Kline, 2005).

SEM Model Construction

The designated latent factors within the SEM models were constructed to empirically address the theoretically-based research literature on organizational learning. The SEM models incorporated input, achievement, engagement, and climate latent factors. The measurable variables associated with each of the latent factors are listed below:

Input

Percentage of students receiving free and reduced lunch ("FRL")

Percentage of minority students ("Pct_min")

Percentage of students suspended during academic year ("Discipline")

Achievement

2007 Mathematics Proficiency "Math07"

2007 Reading Proficiency "Read07"

2008 Mathematics Proficiency "Math08"

2008 Reading Proficiency "Read08"

2009 Mathematics Proficiency "Math09"

2009 Reading Proficiency "Read09"

Engagement

Percentage of all classrooms coded as student disengagement ("T1")

Percentage of all classrooms coded as student engagement with teacher inattentiveness ("T2")

Percentage of all classrooms coded as higher-order student conversations ("T5")

Percentage of all classrooms coded as higher-order student engagement with content material ("T6")

Climate

School climate survey questions that question the respondents about school *Safety.*

School climate survey questions that question the respondents about school *Environment*

School climate survey questions that question the respondents about school *governance*

School climate survey questions that question the respondents about school *academic rigor*

Findings

Table Two below provides the output for relationships between school inputs and school climate, student engagement, and student achievement levels of 64 schools that incorporated the IPI in 2006-2007. The achievement-climate relationship was categorically evidenced to be moderately negative. The strength of this negative relationship ranged from -.38 and -.46. The findings for Models 1, 2, 6 that evidenced this negative relationship were all highly significant. (p=.01). With the exception of Model 1, the inputs-climate relationship was evidenced to be moderately positive, with correlational magnitudes ranging between .40 and .67.

The inputs-achievement relationship was determined to be exceedingly negatively related, with a correlation value of -.96 that was statistically significant at the p=.01 level. The relationships between student engagement levels and climate factors did not yield statistically significant findings. A moderate negative correlational relationship was evidenced between lower-order thinking latent constructs and student achievement, while the higher-order thinking latent factor constructs were not found to be correlated with achievement to a statistically significant extent. The relationship between higher-order student engagement levels and inputs was found to be statistically insignificant in two instances, one weakly so (-.14), while the other relationships were considerably more notable (-.56 and -.51). The relationship between educational inputs and higher-order thinking was found to be moderately negative.

Elaboration on Points of Interest

Consistent with the findings of similarly-conducted statewide studies, it appears to be the case in this study of exclusively urban schools that inputs deleteriously impact higher-order student engagement levels to a more considerably tempered extent than that of the output-achievement relationship. The inputs-climate findings are perplexing, as school climate factors that have historically been demonstrated to be positively related to achievement and negatively related to FRL and the percentage of minority students was, in this study of urban schools, positively related. A moderate relationship was evidenced between climate factors and

achievement in the negative direction. Plausible explanations for this unexpected relationship are several: 1) A considerable disconnect exists between the perceptions of school leaders and the on-the-ground realities of the public educational settings; 2) School staff are less focused on "skill and drill" teaching mechanics, instead opting to convey information in creative, unconventional manner, enhancing their stratification and the perceived efficacy while failing to provide students with information for standardized testing; 3) teachers are biased in inflating their beliefs, attitudes and assessments of their specific schools due to a strong attachment to these settings.

As has been evidenced in prior SEM studies, and in decades-long research on socioeconomic composition of student body and student achievement, these demographic variables were found to be extremely highly negatively correlated with achievement (-.96, p=.01). The more elevated magnitude associated with MWPSS lends evidence to suggest that the relationship is somewhat exacerbated in urban settings.

Table Two: 64 Schools Output (2006/2007 IPI with 2007-2008 Achievement)

Factor Relationship	Strength	Model
Achievement-Climate	-.38**	Model 1
Achievement-Climate	-.46**	Model 2
Achievement-Climate	-.48**	Model 6
Inputs-Climate	.29	Model 1
Inputs-Climate	.59**	Model 2
Inputs-Climate	.48**	Model 3
Inputs-Climate	.50**	Model 4
Inputs-Climate	.40**	Model 5
Inputs-Climate	.67**	Model 6
Inputs-Climate	.51**	Model 7
Inputs-Achievement	-.46	Model 1
Inputs-Achievement	-.96**	Model 2
Engagement-Climate	-.11	Model 1
Engagement-Climate	.78	Model 2
Engagement-Climate	-.01	Model 3
Engagement-Climate	-.13	Model 4
Engagement-Climate	-.22	Model 5
Engagement-Climate	-.02	Model 6
Engagement-Achievement	.22	Model 1
Engagement-Achievement	-.31*	Model 2
Engagement-Achievement	.04	Model 6
Engagement-Inputs	-.35	Model 1
Engagement-Inputs	.36	Model 2
Engagement-Inputs	.35	Model 3
Engagement-Inputs	-.56**	Model 4
Engagement-Inputs	.51*	Model 5
Engagement-Inputs	-.14**	Model 6

LOT-HOT	-.86**	Model 7
Climate-HOT	-.15	Model 7
Inputs-HOT	-.45**	Model 7
Inputs-LOT	.02	Model 7
Climate-LOT	.20	Model 7

Comparison of the Entire Population Sample with the "Early Adopters"

Table Three provides the output for the larger sample of 125 schools tested over a more elongated temporal horizon. While the achievement-engagement relationship was found to be statistically insignificant for higher-order thinking, moderate and moderate-to-strong negative correlations were evidenced between lower-order thinking and student achievement (-.33, and -.69, p=.01). Additionally, the input-engagement relationship was found to be moderately positively correlated to the lower-order thinking construct (.34, p=.05) and moderately negatively correlated to the higher-order thinking latent factor construct (-.40, p=.01). As in the 64 school sample, the input-achievement relationship was found to be considerably greater than the input-engagement relationship (-.96, p=.01). It was again the case that climate survey responses were found to be weak to moderately correlated with lower-order student engagement levels, as well. In this larger set of 125 schools, the relationship between climate and achievement levels were found to be negative, without exception, as the climate latent factor constructs were moderately negatively correlated with the achievement latent factor constructs. Furthermore, the climate factor constructs were evidenced to be positively correlated to the school input variables that detrimentally impact standardized achievement levels to a magnitude that virtually mirrored the 64 school set of early IPI-adopter schools.

Climate-achievement magnitudes were moderately negative in both sample sets, with the larger 125 school sample evidencing a statistically significant relationship more consistently, and to a slightly more elevated extent. The directionality of the input-engagement relationship were consistent in both sets of tested models, while the magnitudes of these relationships were not remarkably different across sets. Similarly, the input-achievement relationship was evidenced to be highly significant (-.96, p=.01) in both population samples. The climate-engagement relationship was only found to be statistically significant in the larger 125 school set, which prohibits across-sample comparisons. The climate-achievement relationship was evidenced to be moderately negative in both samples, with more elevated negative correlations were found in the larger 125 school set (-.48 in the former and -.57 in the latter). The climate-input correlational relationships were quite similar across both sets, as well (.64 vs. .67).

Table Three: 125 Schools Output – 2006-2009 IPI with 2007-2009 Achievement

Factor Relationship	Strength	Model
Achievement-Engagement	-.69**	Model 1
Achievement-Engagement	.22	Model 2
Achievement-Engagement	.18	Model 3
Achievement-Engagement	.11	Model 4
Achievement-Engagement	-.33**	Model 5
Input-Engagement	.29	Model 1
Input-Engagement	.57	Model 2
Input-Engagement	-.40**	Model 3
Input-Engagement	-.25	Model 4
Input-Engagement	.34*	Model 5
Input-Engagement	-.69	Model 6
Input-Engagement	-.69	Model 7
Input-Achievement	-.62**	Model 1
Input-Achievement	-.96**	Model 2
Input-Achievement	-.95**	Model 3
Input-Achievement	-.96**	Model 4
Input-Achievement	-.96**	Model 5
Climate-Engagement	.26	Model 1
Climate-Engagement	-.17	Model 2
Climate-Engagement	-.14	Model 3
Climate-Engagement	-.04	Model 4
Climate-Engagement	.26**	Model 5
Climate-Engagement	-.15	Model 6
Climate-Engagement	-.15	Model 7
Climate-Achievement	-.57**	Model 1
Climate-Achievement	-.44**	Model 2
Climate-Achievement	-.42**	Model 3
Climate-Achievement	-.38**	Model 4
Climate-Achievement	-.44**	Model 5
Climate-Input	.43**	Model 1
Climate-Input	.56**	Model 2
Climate-Input	.50	Model 3
Climate-Input	.45**	Model 4

Climate-Input	.53**	Model 5
Climate-Input	.64**	Model 6
Climate-Input	.64**	Model 7

"Matched Models"

Two SEM models were configured with identical latent factors and accompanying measurement variables to test for potential differences not only between the early IPI adopters (the 64 schools that adopted the IPI in 2006) and the wider 125 school set that includes IPI observations from 2006-2009. This enabled the researcher compare differences in all schools and the early implementer schools, which enjoyed a more sustained experience with the IPI, and might benefit from the longevity of IPI usage. The findings from the two SEM models, provided in Table Four below, reveal only slight differences in correlational magnitudes. Perhaps most noteworthy is the statistically significant correlational relationship between the higher-order student engagement and student achievement constructs (.21, p=.01) which is considerably less impressive than the magnitudes evidenced for lower-order thinking and achievement relationship, where correlations ranged from -.33-.69.

Table Four: Match Schools Runs (125 Schools vs. 64 Schools' Runs in Previous Test with Identical Model Constructions)

Factor Relationship	Strength	Model
Input-Engagement	-.39**	Match Model 1
Climate-Engagement	-.11	Match Model 1
Climate-Input	.47**	Match Model 1
Climate-Input	.61**	Match Model 2
Achievement-Engagement	.21*	Match Model 1
Achievement-Input	-.92**	Match Model 1
Achievement-Climate	-.38**	Match Model 1
LOT-HOT	-.76**	Match Model 2
Input-HOT	-.42	Match Model 2
Input-LOT	.37	Match Model 2
Climate-HOT	.15	Match Model 2
Climate-LOT	.27	Match Model 2

Empirical Findings Summary

The current study focused on a single case study, the "Mid-West Public School System, where student engagement data from the Instructional Practices Inventory was collected in 125 (56% of all schools) in the district. The findings of the study were surprising in some cases and compelling in most instances. A consistent trend of positive correlational relationships between school-level inputs and school climate, a finding expected to be negative, was found to be moderately positive almost without exception. Additionally, these school inputs, while demonstrated by the literature to evidence a heavily deleterious impact on standardized achievement, were similarly found to be extremely negatively correlated in the present study. These school inputs' effects on student engagement levels, while remarkable, were less so than with student achievement levels. Finally, the relationship between lower order thinking and student achievement exhibited a negative correlational relationship that was considerably more elevated than the positive relationship found to exist between higher-order thinking and student achievement levels.

Perhaps the most perplexing finding involved the negative relationship between the school climate survey results and the student achievement levels. This relationship was consistently demonstrated across SEM models to be a negative correlation. While plausible explanations for such a finding are several, this allows the researcher to infer with confidence that staff perceptions that reflect positively on the climate aspects of public educational settings do not translate into enhanced standardized student achievement levels within these schools.

School Practitioner Takeaways

The findings from this study provide valuable guidance not just to educational researchers interested in more encapsulating statistical methodologies, but to schools policymakers and practitioners interested in the effects of school inputs and student demographics on student engagement and standardized achievement. ***The following findings from the study were especially compelling***:

1) A school's climate appears to be associated with standardized achievement levels, but **not to the extent that an unhealthy educational atmosphere can alone doom a school to low student achievement levels**.

2) A school's climate does appear to be correlated with educational inputs and the socioeconomic composition of student bodies to a moderately strong extent. Consequently, a school's climate may be an amorphous artifact that can be at least **partially restructured through policies that compensate for disparities in educational inputs and the compositions of student bodies**.

3) Far more striking is the correlation of educational inputs and standardized achievement, which are as strongly opposite one another as any population of schools tested under similar parameters. Accordingly, **urban school leaders and policymakers should take note of empirical evidence that suggests educational inputs are related student achievement levels to a severely negative extreme**.

4) Educational inputs and the composition of a school's student body are also moderately correlated with student engagement levels. The nature and levels of student engagement are a desirable building-level objective to target. **While it is likely these student engagement levels can be favorably manipulated by educational initiatives such as the IPI, it is also important to acknowledge the likely importance of school resources and other socioeconomic considerations in the process, as well**.

5) Finally, standardized achievement levels are found to be moderately correlated to student engagement levels. Such a finding is highly intuitive, **as increases in higher-order student engagement levels should better prepare students to engage in critical thinking practices that enable them to succeed on standardized tests**.

6) Interestingly, temporal comparisons of urban schools that have adopted the IPI initiative over a sustained duration did not yield findings that varied markedly from schools who only incorporated the IPI practices during the short-term. Such a finding **might suggest that the IPI either takes more protracted efforts to gain traction in urban settings**. Conversely, the relationship between educational inputs with student engagement and student achievement **might be largely static, such that empirical test describe the nature of a relationship not likely to change considerably over time**.

References

Bontis, N., Crossan, M.M., & Hulland, J (2002). Managing an organizational learning system by aligning stocks and flows, *Journal of Management Studies, 39*(4), 437-469.

Born, P., Wen, M., & Lin, H. (2007). Application of structural equation modeling on the linkage of risk management, capital management, and financial management. Casualty Actuarial Society, CAS/SOA Final.

Byrne, B. B. (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.

Conley, S., Muncey, D.E. & You, S. (2005). Standards-based evaluation and teacher career satisfaction: A structural equation modeling analysis. *Journal of Evaluation Education, 18*, 39-65.

Donovan, C. Figlio, D. and Rush, M. (2006). Cramming: The effects of school accountability on college-bound students. *National Bureau of Economic Research*, Working Paper No 12628.

Fiol, C.M. & Lyles M.A. (1985). Organizational learning, *Academy of Management Review*, *10*(4), 803-813.

Guo, B., Perron, B., & Gillespie, D. (2008). A systematic review of structural equation modeling. British Journal of Social Work, 1-19.

Hoe, S.L. (2008). Issues and Procedures in Adopting Structural Equation Modeling Technique. *Journal of Applied Quantitative Methods, 3*(1), 76-83.

Hoy, W. K., Tarter, C. J., & Hoy, A. W. (2006). Academic optimism of schools: A force for student achievement. *American Educational Research Journal*, *43*(3), 425-446.

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: Guilford Press.

Simon, H.A. (1952). Comments on the theory of organizations, *The American Political Science Review*, *46*(4), 1130-1139.

Valentine, J. W. (2005). *Instructional practices inventory: Profiling student engagement for school improvement.* Columbia, MO: Middle Level Leadership Center, University of Missouri (www.MLLC.org).

Valentine, J. W. (2007). *The instructional practices inventory: Using a student learning assessment to foster organizational learning*. Columbia, MO: University of Missouri (www.MLLC.org).

Valentine, J.W. (2008) Middle Level Leadership Center (MLLC) Website material published by Director Jerry W. Valentine. University of Missouri.

Willms, J.D. (1999). Basic concepts in hierarchical linear modeling with applications for policy analysis, in Gregory J. Cizek (Ed.). *The Handbook of Educational Policy*. San Diego, CA: Academic Press.