A Study of Student Engagement and Achievement at School and District Levels

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Problem Statement

The passage of the No Child Left Behind (NCLB) Act has ushered in an era of unprecedented accountability standards (Kirsh & Yamamoto, 2007). The fiscal toll that the NCLB legislation has imposed on states is rivaled by the instructional and curricular pressures imposed on school districts. A paramount concern of education leaders is to ensure that the mechanisms that they construct to comply with the NCLB accountability provisions yield their desired outcomes (Linn, Baker, & Betebenner, 2002). In recent years, however, school leaders have supplanted ideal classroom learning environments with instructional efforts and curricular initiatives tailored to achieve the 100 percent test passage rate mandated by NCLB. It is not inconceivable that a myopic fixation on achieving accountability benchmarks breeds a desperate urgency among school leaders, to the extent that some administrators prescribe curricular and instructional changes within their schools rather than collaborative with teachers to craft these school-level initiatives.

As school leaders craft curricula that are tightly bound to grade-level expectations that exactly mirror the standardized test content areas, they conspicuously suspend their efforts at teaching children to learn and think critically and to explore their own intellectual interests (Freeman, 1989). These heightened accountability demands often mask the fact that students will be forced to think critically and creatively not simply on standardized tests but for the remainder of their professionals lives (Geertsen, 2003).

Purpose

The purpose of this study is to ascertain whether the levels of higher-order thinking and active student engagement within schools are statistically related to schools' standardized test score performance. Few studies to date have empirically tested the relationship between standardized test performance and the level of student engagement within classrooms.

Ultimately, school administrators and faculty leaders act as “street level bureaucrats” (Lipskey, 1980) within schools. While it is invariably the case that they must adhere to federal legislative mandates, such school leaders can meet and ultimately surpass such expectations by engaging their students in higher-order thinking and immersing them in demanding, yet creative, curricula that incorporate standardized test concepts as a starting point for intellectual inquiry. The Instructional Practices Inventory (IPI) is an instrument that enables classroom observers to empirically capture the nature of student engagement at the school-wide level. Teachers and school leaders can employ IPI findings to better inform their instructional and curricular decision-making while concomitantly assessing the current instructional health of their schools. The IPI process fosters highly collaborative, democratic faculty study sessions, in which teacher input and empowerment is cherished.

Review of Literature

The current literature is surprisingly bereft of studies that examine the extent to which relationships exist between the levels of student engagement and higher-order thinking within schools and the standardized test performance of students within those schools. Higher-order thinking can be equated with a more exacting form of critical thinking (Underbakke, Borg & Peterson 1993; Cotton, 1989). Student learning appears to be an input that schools can directly control (Phelps, 2006) As such, the socio-economic status of students and other demographic variables might be a more hollow indicator of student standardized test performance than is conventionally presumed. In an unfortunate misperception, educators and educational leaders deem higher-order student engagement, in which students are actively engaged in critical thinking and discourse with their peers, to be fundamentally at odds with appropriate test preparation for standardized tests. Weast (1996) argues, however, that "absorbing knowledge and critical thinking are not mutually exclusive" (p. 193). Hence, fertile ground exists for vigorous study of the potential nexus that might exist between higher-order student thinking and enhanced levels of student performance on standardized tests.

As instructional leaders prepare students to become competent citizens, employers in the global economy place a high value on rationality and the ability of employees to deftly process information (Nickerson, 1989). The current challenge for teachers is not simply to teach thinking, but rather to teach good thinking (Nickerson, 1989). Educators often forget that teaching students how to learn is different from simply teaching them how to take tests (Cooper, 1989). The narrow focus on test preparation has encouraged teachers to promote rote learning. While the demands upon students in the future will demand critical-thinking skills, schools are not sufficiently equipping students to meet such challenges. Greeno (1997) convincingly argues that appropriate thinking skills are not being taught in schools, when he notes that "the activities of school learning are mainly organized so that students can accumulate the skills that they need to think with rather than presenting them with problems that present challenges for complex thinking for which they are assumed not to be ready" (p.88). Student acquisition of the appropriate procedures and strategies for applying knowledge in problem solving and reasoning requires more than simple factual recall (Greeno, 1997). Students derive benefit from participation in classrooms where learning to think thrives (Greeno, 1997). Unfortunately, inadequate teacher training and the teaching initiatives that are often associated with the standardized test movement have greatly impeded effective teaching skills. The teaching of thinking should be a fundamental goal of education, as it will best equip students to be effective not only in the classrooms but when they enter the highly demanding workforce (Nickerson, 1989).

Research has been encouraging, as students reveal that they are highly desirous of actively engaging in inquiry and sense-making, and effective student engagement and learning incorporates content that is of relevance to students' current and future personal situations (Greeno, 1997). Nickerson (1989) suggests that as teachers engage students in strategic thinking activities, this enables these students to become conscious of their own thinking and learning, and this student ownership of his or her learning will be an empowering feature that transcends their time in the classroom (Nickerson, 1989). Reflective thinking helps students consolidate and extend their knowledge base (Brophy, 1990). The teacher-student dialogue should include learning application opportunities, as well (Brophy, 1990). When students become active participants in their own assessments, for instance, they develop a sense of responsibility that is required not only of capable students, but of capable citizens (Greeno, 1997).

Higher-order and critical thinking are not the inevitable byproducts of complex task assignments associated with teacher instruction (Marzano, 1993). Instead, critical thinking results from the engagement of students in tasks where the answer is not readily apparent, pushing the limits of student knowledge, and generating new and unconventional ways of viewing situations (Marzano, 1993). Engaging students in abstracting strategies, for instance, requires that a student "links literal information to that which does not appear related at a surface level" (Marzano, 1993, p.158). As standardized testing instruments in most states have begun to incorporate elements of critical and abstracting thinking, students must possess a sound grounding in such practices in the classroom if they are to replicate such behavior as they sit for standardized tests.

Assessing the nature and vigor of student learning in schools is an important component of improving school performance. There exists the need for classroom observations that can provide teachers with accurate and relevant data on the integrity of their instruction (Skretta, 2007) and the quality of students' classroom contributions and learning (Valentine, 2008). Indeed, the importance of data reflection within schools has been well documented, and district-led data sessions can serve to inform schools of their current instructional practices (Valentine, 2008). As school leaders incorporate such data into their faculty discussions, they can democratically form decisions about how to best proceed in improving teacher instruction, and subsequently, engagement and student learning (Valentine, 2008).

Data collected from classroom walkthroughs which captures student engagement and the teachers' pedagogical practices that foster such student participation can prove to be a valuable data source. A properly designed and performed walk-through process can entail identifying both the nature and extent of student engagement within classrooms, as well as collecting information that can later be used to facilitate productive faculty discussion on how to best improve the instructional environment within the school (Valentine, 2008). The objectives associated with school reform and improvement will invariably focus on standardized test performance. More specifically, school leaders can engage in the following chronological protocol to best prepare their students to perform proficiently on standardized tests: 1) data acquisition, 2) data reflection, 3) program alignment, 4) program design, 5) formative feedback, and 6) test preparation (Halverson et al., 2007). Another sound method of collecting and reflecting upon school-based data involves classroom walkthroughs to ascertain the quality of student learning (Skretta, 2007). Skretta (2007) offers the following suggestions to better facilitate the school walk-through process:

1. Talk with teachers beforehand
2. Schedule walkthroughs as a typical part of the school day
3. Track the frequency of visits to the classroom
4. Provide teacher feedback with in 24 hours
5. Affirm the positives
6. Trust is maintained through consistency.

Walkthroughs should be conducted with sufficient frequency. Such an effort should not be restricted to the school administration. Instead, argues Brophy (1990), it is the teachers who should lead productivity reflection and assessment sessions geared around student learning and student progress (Brophy, 1990).

As concerned community members and state mandates demand that schools demonstrate impressive growth in test performance in successive years, the metric upon which the work of school leaders is gauged is largely predicated upon their ability to improve student achievement scores (Halverson et al., 2007). The observations and data gleaned from classroom walkthroughs can enable more than simple administrative oversight, as it “can be used to generate conversations with teachers regarding student learning and their use of best educational practices” (Skretta, 2007). Teacher evaluations that are ultimately designed around clearly formulated objectives can provide meaningful information about schools and teachers alike (Brophy, 1979; 1990).

Educational leaders within school districts will remain illiterate in how to best broach accountability reform efforts if they are unfamiliar with data processing and analysis (Cooley et. al, 2006). The sound and effective incorporation of school assessment protocols and mechanisms is not an inherent feature to either schools or the administrators that lead such efforts. Indeed, students are not the only ones that must learn in schools, and administrators and school leaders must learn to acquire deftness for collecting data and assessing classroom practices. Such an acquired skill is learned over time, and given the scope and scale of learning that must occur at the building level, an active consideration of organizational learning literature is warranted.

Organizational learning in the contemporary era invariably involves the incorporation of data and information systems. In the 21st century information age, organizational learning must be considered in the context of this new and rapidly evolving environment. Schools are no exception, of course, as standardized test performance data are now not only desired at the aggregate level, but disaggregated to track subgroup, and even individual student progress. Incorporating information systems that enable organizational leaders to digest complex information mitigates the possibility that the organization undertakes blind trial-and-error learning, as documented by Van de Ven & Polley, 1992. A feedback effect of prior actions and outcomes on subsequent courses of organizational action can be employed in organizational planning. (Van de Ven & Polley, 1992). Van de Ven & Polley (1992) postulate that adaptive learning occurs as prior organizational actions that yield favorable results stimulate the continuation of that given course of action. The continuity associated with such action increases the likelihood of successful task execution (Van de Ven & Polley, 1992).

School leaders oftentimes find it to be difficult to remain composed and maintain measured responses to the heightened pressures of NLCB Act. Attempts at school reform, however, require that the faculty believe that change is needed and that they plan for such change appropriately and rationally (Moe & Chubb, 1990; Witte & Walsh, 1990). The NCLB Act leaves school leaders with little choice but to fundamentally alter the nature of their educational instruction. Teacher commitment to meaningful change and the extent to which actors are willing to become actively involved in such change efforts is invariably required of school improvement and reform efforts (Leithwood, 1994). Furthermore, continuous communication between the various school actors, as they seek to accomplish their objectives, is a key requisite to ensuring successful improvement efforts (Ferrara, 2007). While these school change efforts need not be incremental, they cannot be adopted in the form of a shock treatment, either. Indeed, successive approximations that build upon previous change efforts have been demonstrated to work well (Leithwood, 1976).

Research Questions

1. What is the relationship between student engagement in IPI treatment schools and their standardized test performance levels? (SEM)
2. What is the relationship between the integrity of IPI practices within a school and the school's culture and climate? (SEM)
3. What is the relationship between a school's culture and climate and their standardized test performance levels? (SEM)
4. What is the relationship between impactful school resources and student achievement levels? (HLM)

Research Design

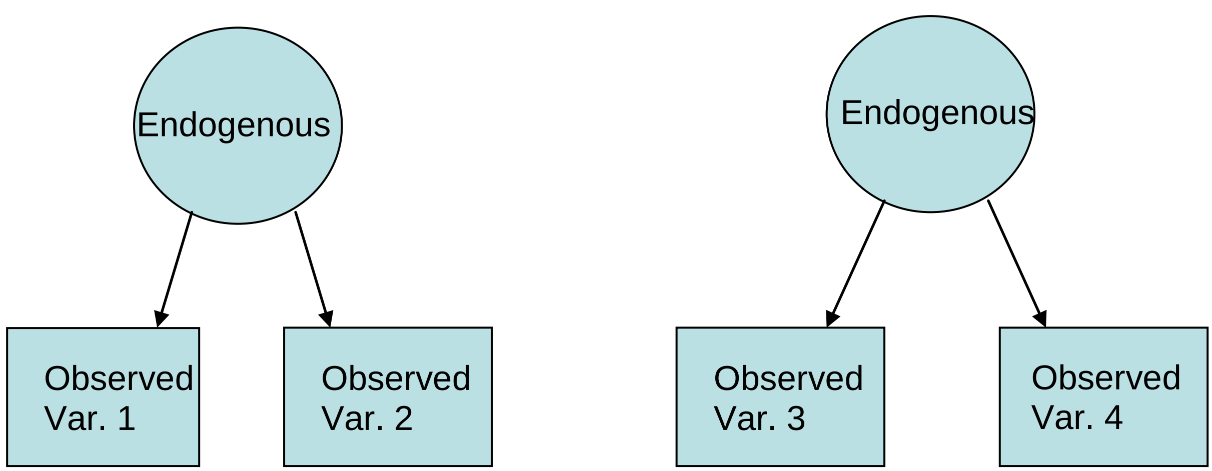
This study is a quantitative design, incorporating data yielded from classroom walkthroughs, where observers employ the Instructional Practices Inventory instrumentation (IPI), follow-up surveys from schools using the IPI process, and selected contextual variables commonly associated with student achievement.

The IPI-trained data collectors are trained to ascertain both the nature and proportion of higher-order versus lower-order learning. IPI school profiles are then generated from the trainers' observation data, which ultimately provide a holistic statistical depiction of student engagement. From such profiles, the researcher can determine if a relationship exists between the level of higher-order thinking that occurs between schools' student populations and the state standardized test score performance of these students.

A state-wide survey of schools using the IPI process provided the IPI student engagement profiles, ranging from completely disengaged to engagement in higher-order thinking (Valentine, 2008). Principal and teacher-leader responses provided illustrative data that capture the frequency and integrity of the implementation of the IPI treatment. All free-response items from the survey were given pre-designated codes, allowing the statistical relationships with other school-level and district-level data publically available from the state department of education (Valentine, 2008).

The data captured from the IPI observation process is a rich resource with which to investigate the relationship between school input factors and student engagement levels and the standardized test performance that results from the nature of classroom learning environments. Structural equation modeling represents a sound statistical methodology that can be employed to better appreciate the confluence of student engagement levels, school culture and climate factors, and demographic and resource variables that are responsible for student achievement levels. Structural equation modeling ultimately allows the researcher to determine the extent to which the IPI more directly influences test scores by revealing those observed variables and latent factors that exhibit an influence on one another, and ultimately upon standardized achievement levels. More specifically, performing Confirmatory Factor Analysis (CFA) enables the researcher to identify those variables that interact with one another in manner which allows such factors to be identified and grouped as distinctive factors. This paring down of the many school-level and more aggregate variables of the study enables the researcher to construct regression models that are reasonably parsimonious. The general form of the CFA Structural Equation Model is depicted in Figure 1.

Figure 1



The CFA models can become quite complex, as they can assume a multi-level or tiered structure. Such models are oftentimes identified as 2nd order Confirmatory Factor Analysis (CFA) models. These 2nd Order CFA models have been demonstrated to be especially effective in studies such as the current research undertaking, as latent exogenous variables themselves often interact in such a fashion as to constitute latent endogenous variables that can be captured by a 2nd order latent exogenous variables. Figure 2 offers a visual depiction of the structure that a 2nd order confirmatory factor analysis model commonly assumes.

Figure 2

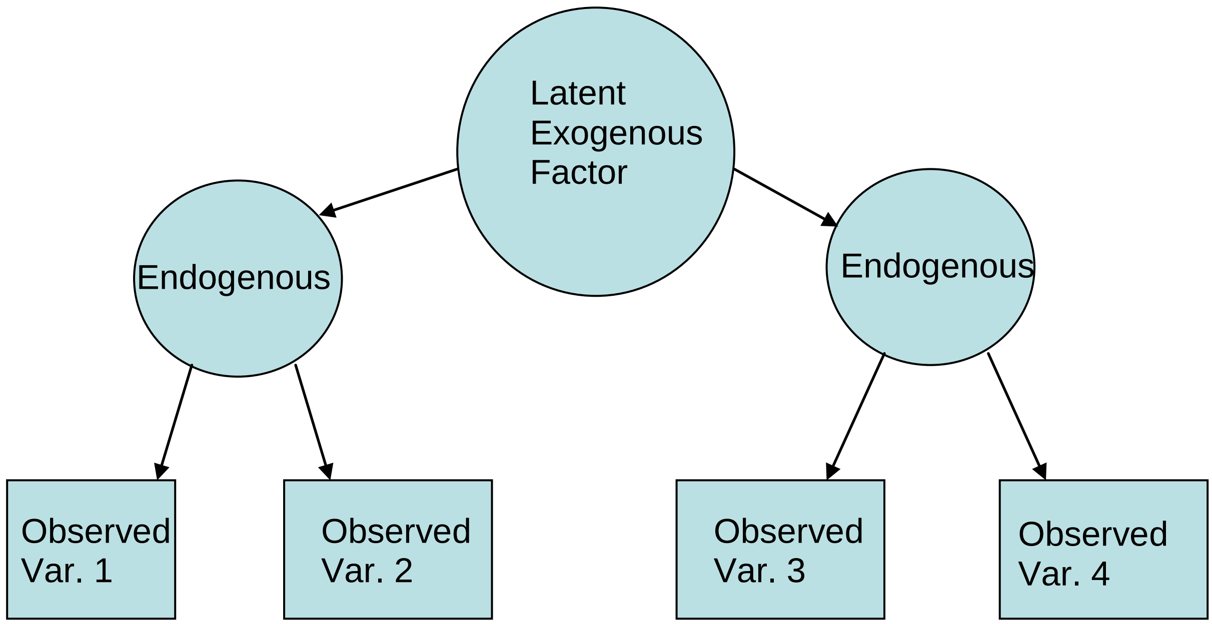
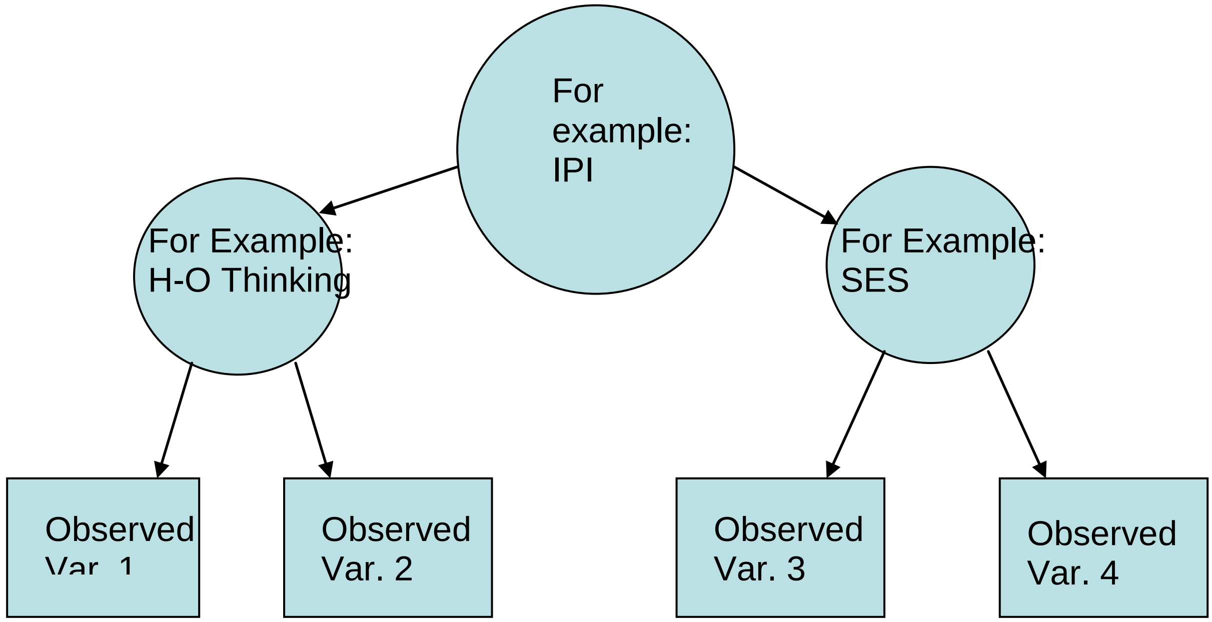


Figure 3 below reveals the basic form that the 2nd order CFA model of the IPI might assume.

Figure 3



Given the scope of the present research project, Hierarchical Linear Modeling (HLM) becomes especially desirable as the researcher attempts to identify the many variables and factors that are nested within distinctive contextual units under which schools function. Simply put, these methods enable statistical relationships to be postulated between school demographic factors and standardized test performance. More specifically, the CFA findings can complement the purpose and objectives associated with the HLM level-four model. Namely, CFA might prove to be desirable as it enables the researcher to corroborate the findings yielded by the HLM models. Indeed, by duly considering the findings from both the SEM and HLM models, the researcher is able to more definitively determine whether the introduction of the Instructional Practices Inventory, when adopted by a school in good faith and with a sufficient level of integrity, will positively influence the magnitude of influential climate and culture factors within schools. This, in turn, might allow the researcher to advance qualified causal claims as to which factors ultimately influence schools' standardized test score performance.

The CFA model serves as a sound starting point for the present research, as 37 school district leaders have submitted surveys that reveal the frequency and perceived integrity with which the IPI has been implemented. Such survey results, when coupled with student and school level demographic factors, provide data that enable the researcher to conduct CFA. The results of the CFA might offer a telling statistical representation of the interaction of these many factors within the public education environment. As the researcher incorporates student achievement and demographic data from 72 schools within the level-one model, these same 37 survey results were doubled to enable a simulated one-to-one pairing of the present survey findings with the observed school variables associated with the wider sample size of the schools studied (n=72). The school district and RPDC levels will incorporate these two units in nested structure. The commercially available HLM 6.04 software enables the researcher to deftly accommodate the nesting features that are required of these more complex regression models. Hence, the eventual output from the CFA will enable a more meaningful account of the preliminary data by utilizing in these HLM models.

For the purposes of the present study, Hierarchical Linear Modeling (HLM) regression analysis was employed to determine whether a statistical relationship existed between the level of student learning and engagement within and across schools and the standardized test performance of such schools. The Hierarchical Linear model will be accounted for within school (Level-1), and within district (Level-2) data nesting effects. The Level-1 (within school) variables will include: 1) socioeconomic status and 2) ethnicity (Percentage minority) The Level-2 (Survey of Schools) variables will include the 1) IPI Implementation

Frequency and the 2) IPI Implementation Integrity as evidenced by the survey respondents. The Level-3 (within district) variables will include: 1) graduation rate and 2) ACT scores. Finally, the Level-4 (within RPDC) variables will include the 1) level of teacher experience and the 2) teacher-administrator ratio, two variables commonly associated with effective schooling. The RPDC's, or Regional Professional Development Center's, represent a collection of schools within nine geographic regions across the state. For the purposes of this study, the RPDC's represent an appropriate level to be modeled in HLM as schools within such discrete geographic locales generally tend to interact with, and incorporate similar practices, as their counterparts across the region. The findings yielded by the HLM can then be compared to the findings produced by Confirmatory Factor Analysis (CFA) using Structural Equation Modeling (SEM). The form that the Level-4 model for the present study ultimately assumes is presented in Figure 4.

Figure 4

Level-1 Model

Y = P0 + P1*(FRL) + P2*(PCT_MIN) + E

Level-2 Model

P0 = B00 + r0
P1 = B10 + B11*(Q12)
P2 = B20 + B21*(Q14)

Level-3 Model

B00 = G000 + u1-1
B10 = G100
B11 = G110 + G111*(AVG_ACT)
B20 = G200
B21 = G210 + G211*(GRAD_RAT)

Level-4 Model

G000 = d0000 + v000
G100 = d1000
G110 = d1100
G111 = d1110 + d1111*(TCHEXP)
G200 = d2000
G210 = d2100
G211 = d2110 + d2111*(ADMTCH)

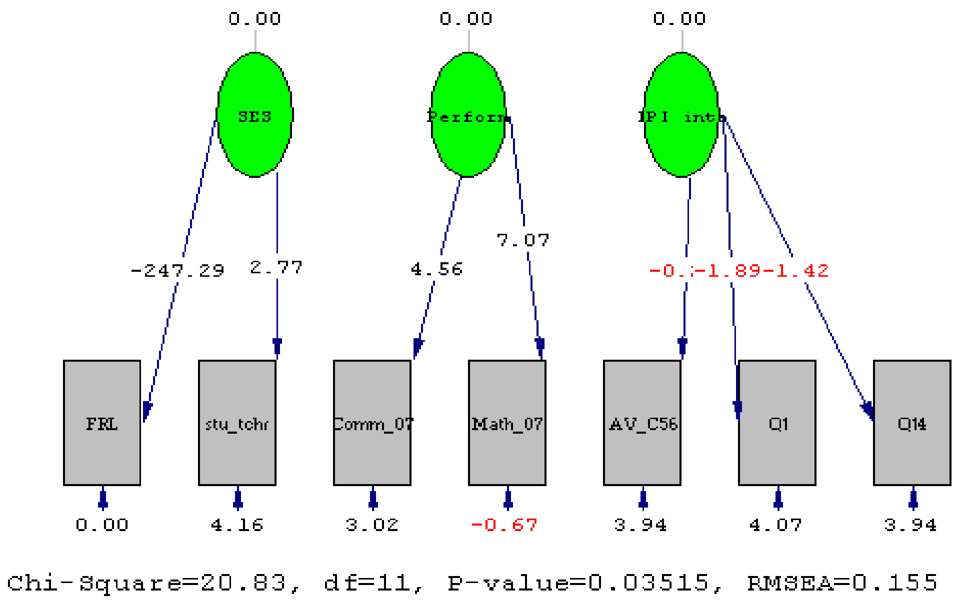
Findings

SEM Model

Structural equation modeling (SEM) was employed to both corroborate the findings of the HLM model and to explore the possibility of distilling the many variables in the 4-level HLM model into more coherent explanatory factor groupings. Confirmatory factor analysis (CFA) was used to test the hypothesis that basic socio-economic indicators were statistically associated with an SES factor, while standardized test performance on math and communications arts was similarly grouped as a factor. Finally, the introduction of the IPI, and the integrity with which it is incorporated, is captured by the observable values of the average percentage of higher-order learning in core classrooms, the average number of data collections within a school, and the integrity with which the IPI process was conducted.

The findings of the structural equation model were telling, but not as robustly so as was presumed before conducting the Confirmatory Factor Analysis. The FRL T-value was found to be a very highly significant -247.3, whereas the student to teacher ratio T-value is 2.8. Both of values exhibited magnitudes in the expected direction within the “SES” latent factor. The “Performance” latent factor exhibited moderate T-values on both the Communication Arts pass rate endogenous indicator variable and the 2007 mathematics endogenous indicator variable with values of 4.56 and 7.07 respectively. Finally, the “IPI integrity” latent factor evidenced weak relationships with the average higher-order thinking within classrooms (AV_T56), and with questions 1 and 14. All three of these observable variables that were grouped under the “IPI integrity” endogenous variable manifested T values that were less than the significance level of -1.96. As expected, the SES latent factor was negatively correlated with the performance factor, whereas the performance factor was positively correlated with the IPI integrity factor. Figure 5 depicts the CFA model findings in its entirety.

Figure 5



The accompanying output for the CFA model is revealed below in Figure 6.

Figure 6

Global Goodness of Fit Statistics, Missing Data Case

-2ln(L) for the saturated model = 1437.246

-2ln(L) for the fitted model = 1458.079

Degrees of Freedom = 11

Full Information ML Chi-Square = 20.83 (P = 0.035)

***Root Mean Square Error of Approximation (RMSEA) = 0.16

***90 Percent Confidence Interval for RMSEA = (0.040 ; 0.26)

***P-Value for Test of Close Fit (RMSEA < 0.05) = 0.059

The Modification Indices Suggest to Add the

Path to	from	Decrease in Chi-Square	New Estimate
Q1	SES	41.8	2.86
Q1	Perform	14.9	-11.09
Q14	SES	17.7	-0.11

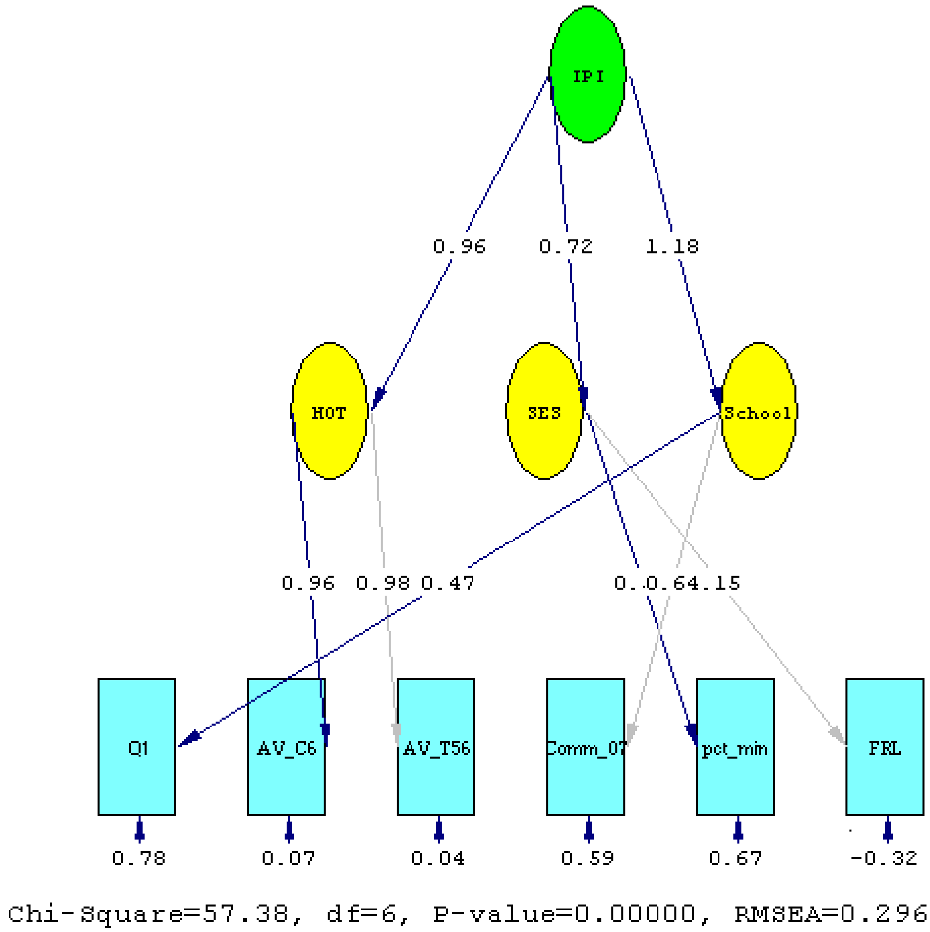
The Modification Indices Suggest to Add an Error Covariance

Between	and	Decrease in Chi-Square	New Estimate
Q1	FRL	37.6	-233.36
Q14	FRL	17.2	9.74

An inspection of the CFA output in Lisrel 8.8 reveals a statistically significant p-value that is associated with the Chi-square value of 20.83 for 11 degrees of freedom. The root means square error of approximation (RMSEA) was determined to be somewhat elevated at .16. While the RMSEA value is generally desirable at level of .10 or less, an inspection of the 90 percent confidence interval reveals that the probability of the RMSEA falling within an acceptable range is possible, yet not highly probable. This suggests that while the model is somewhat weak, it is meritorious.

A second-order confirmatory factor analysis (CFA) model was also constructed to demonstrate that the IPI process might itself serve as an exogenous latent variable. Such a latent variable might be demonstrated to act upon, and be impacted by, later factors such as higher-order classroom thinking, a galvanization of performance relative to demographic factors, and the integrity and test performance that results from the IPI introduction. Such a process is pictorially captured in a second order CFA model presented in Figure 7. This model exhibited a robust Chi-square value of 57.4 for only 6 degrees of freedom; nevertheless, the model yields a prohibitively elevated root mean square error of .30. This finding is not surprising, as the second-order structural equation model is an exacting methodology that oftentimes requires a robust sample size. As the number of surveys from IPI schools increases over the life of the present IPI study, the second-order CFA model is expected to become increasingly robust.

Figure 7



HLM Model

Employing a four-level hierarchical linear model is particularly instructive for the purposes of the present study. Students' classroom engagement levels across schools (level-1) can be quantified and considered within the context of detailed surveys that capture the extent to which the IPI is adopted with integrity within those schools (level-2). These schools, in turn, are nested within school districts (level-3) and regional professional development centers (level-4). The purpose of employing such a statistical methodology is principally predicated upon the researcher's desire to obtain greater explanatory power by purging the regression models of controllable error and error variance.

To assemble a 4-level HLM model with scores of predictors would defeat the very purpose of this statistical method. Instead, conducting statistical tests that capture various demographic, financial, and prior test levels should be done parsimoniously, so as to reduce the potential for multi-colinearity or confounding effects. The present study lends itself to the construction of countless models with innumerable indicator permutations across the four levels. Particularly salient in the current accountability era are considerations that surround student minority subgroups and the school and teacher resources that are dedicated to this student population. Accordingly, a 4-level HLM model was constructed to account for such factors. More specifically, two level-1 predictors, the free and reduced lunch rate and percent of minority students, were used for the classroom level.

While the school survey contains fourteen questions, all of which are distinctly illustrative in capturing the integrity of the IPI, questions 12 and 14 were used as predictors within the second level of the 4-level model. These survey questions most adequately captured the frequency and integrity with which the IPI treatments were conducted. The average ACT score and graduation rates within school districts were used as level three predictors within the HLM model. These predictors enabled the researchers to account for the extent to which the school populations were inclined toward high performance on standardized tests. In the context of the Level-2 equation, such predictors ascertained the extent to which already-successful student populations might enable the more seamless integration of the IPI process. Finally, at the RPDC level (level-4), teacher experience and administrator-teacher ratio were used to represent common indicators of talented and wellresourced faculty which serve as predictors of the extent to which these variables might influence the magnitude of students' academic success.

When all indicators are set to a value of 0, the fixed effect of the model is 52.2, indicating that the average Communication Arts test pass rate in 2007 within the sample of IPI-treatment schools is 52.2%. The level-one FRL predicator exhibits a rather strong negative relationship upon the Communication Arts 2007 pass rate, with a slope of -.192 and a highly significant p value of .015. The level-one percent minority predictor yielded a value of -.111; while in the expected direction, the "percent minority" predictor exhibited statistically insignificant p-value of .308. The level-2 predictor of the FRL was quite strong at .407 and a p value of nearly 0. Most surprisingly, the (Q14) level-2 predictor of the percent minority level 1 predictor was very strongly negative, at -.84 with a p value of .059. This seems to suggest that the IPI integrity exhibits an inverse statistical relationship with the proportion of minority classroom enrollment. Figure 8 provides detailed output of the four-level HLM model that incorporated 72 schools (for which there were an accompanying 36 surveys) within 36 school districts and 9 RPDC's.

Figure 8

The outcome variable is COMM_07

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	Apprx. T-ratio	d.f.	P-value
For INTRCPT1, P0					
For INTRCPT2, B00					
For INTRCPT3, G000					
INTRCPT4, d(0,0,0,0)	52.161042	3.272181	15.941	53	0.000
For FRL, P1					
For INTRCPT2, B10					
For INTRCPT3, G100					
INTRCPT4, d(1,0,0,0)	-0.191854	0.076308	-2.514	53	0.015
For Q12, B11					
For INTRCPT3, G110					
INTRCPT4, d(1,1,0,0)	0.406614	0.135196	3.008	53	0.004
For AVG_ACT, G111					
INTRCPT4, d(1,1,1,0)	-0.037459	0.012228	-3.063	53	0.004
TCHEXP, d(1,1,1,1)	0.001551	0.000583	2.659	53	0.011
For PCT_MIN, P2					
For INTRCPT2, B20					
For INTRCPT3, G200					
INTRCPT4, d(2,0,0,0)	-0.111596	0.108242	-1.031	53	0 308
For Q14, B21					
For INTRCPT3, G210					
INTRCPT4, d(2,1,0,0)	-0.838896	0.435600	-1.926	53	0.059
For GRAD_RAT, G211					
INTRCPT4, d(2,1,1,0)	0.006089	0.005796	1.051	53	0.299
ADMTCH, d(2,1,1,1)	0.000021	0.000031	0.678	53	0.501

Implications

The implications for the present research findings are several. The finding of most interest, perhaps, it how the present statistical methods might be refined and advanced to construct a more telling metric of the introduction of the IPI treatment within schools across Missouri. A stronger and more explanatorily incisive statistical methodology that captures the extent to which the IPI is statistically related to student achievement can be generated by comparing the full data set of IPI treatment schools (N=200) with identically situation non-treatment schools (N=200). A consideration of the variance in standardized test performance between treatment and non-treatment schools would represent a sound means of distinguishing the effectiveness of the IPI treatment. Similarly, the percentage of standardized test performance that is explained by the incorporation of the IPI treatment among the sample of IPI treatment schools would also be a telling metric of the impact that the IPI exhibits on students' standardized test performance. Such research questions can be explored with both HLM and SEM (CFA first and second order) models. Finally, a consideration of the correlation between the students' higher-order engagement levels and IPI implementation levels could prove to be nicely illustrative of the effectiveness of the IPI treatment. When the study is complete, we expect that the sample size will be approximately three times the number represented in this preliminary paper. Until that point of expanded sample size, we will withhold the advancement of definitive findings regarding the nature of the relationships among the variables in the study. However, we reiterate our belief that the methodology currently available through HLM and SEM represents a viable means to study the problem we have posed. The results evidenced with our preliminary analyses suggest the promise of the methodology.

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