

**How School Leadership Influences Student Learning**  
**A Test of “The Four Paths Model”**

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### **Introduction**

Considerable amounts of evidence now indicate that school leadership matters a good deal to students’ learning (e.g., Hallinger, 2011; Witziers et al, 2003; Robinson et al, 2009; Leithwood and Sun, 2012) and that the contributions of school leadership to such learning are largely indirect (Hallinger and Heck, 1996; Bossert et al, 1982). Evidence also suggests that school leadership is almost always distributed throughout the organization (Spillane, Diamond and Jita, 2003; Harris et al, 2007 and is most effective where it is needed most (Leithwood, Harris and Strauss, 2010).

The contribution of school leadership to student learning is now sufficiently well documented that the key question facing practicing leaders and leadership scholars at this point is about “how”. How does school leadership influence student learning? Using data provided by teachers and students in six Texas school districts, this study is the most recent test of a conception of variables mediating school leadership’s influence on students referred to as “The Four Paths Model” (e.g., Leithwood, Anderson and Mascall, 2010). A theory of action guiding a 13-year project in Ontario (still underway) designed to improve student achievement by improving the quality of school leadership (Leithwood, in press) is the origin of The Four Paths Model. The current study follows up the most direct empirical test of the four paths framework conducted to this point (Leithwood, Patten and Jantzi, 2010). An extended description and exploration of the four paths framework can be found in Leithwood, Sun and Pollock (2017).

Results of this study provided either full or partial support for the hypotheses used to test The Four Paths Model. These results also argue for a more nuanced and complex set of relationships among variables included in the model than the original version specified.

### **Framework**

The Four Paths framework uses a wide range of existing evidence to help answer questions about how school leadership influences student learning. According to this framework, leaderships' influence, from whatever source, "flows" along four "paths" to reach students – Rational, Emotional, Organizational and Family paths. Each of these paths is populated by key variables which can be influenced by those exercising leadership and have relatively direct and significant effects on students.

**[insert Figure 1]**

Variables on the Rational Path are rooted in the knowledge and skills of school staff members about curriculum, teaching, and learning - the technical core of schooling. The Emotions Path includes those feelings, dispositions, or affective states of staff members (both individual and collective) shaping the nature of their work, for example, teachers' sense of efficacy. Variables on the Organizational Path include features of schools that structure the relationships and interactions among organizational members including, for example, cultures, policies, and standard operating procedures. On the Family Path are variables reflecting family expectations for their children, how those expectations are communicated in family contexts and the social capital available to parents for furthering their children's interests at school.

Selecting the most promising of these variables- a task requiring knowledge of relevant research, as well as local context - and improving their status are among the central challenges facing leaders intending to improve student learning in their schools, according to this framework. As the status of variables on each Path improves through influences from leadership and other sources, the quality of students' school and classroom experiences is enriched, resulting in greater payoffs for students. Over an extended period of time, leaders are urged to attend to variables in their schools in need of strengthening on all Paths.

The need for alignment across paths seems to hugely complicate leaders' work. But, picking only one or two powerful variables on a Path, and planning for the most likely interactions makes the leadership task much more manageable. This way of thinking about the leadership task, however, does add weight to the argument that leaders' success will typically depends on devoting one's attention to a small number of priorities.

### **Variables on the Rational Path**

*Academic Press (AP)*. School improvement research has suggested that Academic Press or Emphasis is a key feature of high performing schools (Cannata, Smith and Haynes, 2017). Hoy and his associates (Hoy, Hannum, and Tschannen-Moran, 1998) define Academic Emphasis as “a combination of teachers setting high, but reasonable goals, students responding positively to the challenge of these goals, and the principal supplying the resources and exerting influence to attain these goals” (p. 342). Academic Emphasis has been found to be positively related to achievement in all types of schools including schools serving poor and minority students (Goddard, Hoy and Hoy, 2000; Hoy, Tarter, and Hoy, 2006), with its effect stronger in low-SES high schools (Shouse, 1996). For low and middle SES schools, the greatest achievement effects follow from strong combinations of communality and Academic Emphasis (Shouse, 1996).

*Disciplinary Climate (DC)*. School disciplinary climate includes: students’ discipline concerns, class disruptions, student absenteeism and tardiness, students counseling about discipline, students’ discipline experience, the rules for behavior, race or cultural conflicts at the school, students’ behaviors and the punishments for misbehaviors at the school, teachers’ behavior, teacher-student relations (Ma and Willms, 2004). Disciplinary Climate has a significant relationship with student learning (Leithwood et al., 2010). Its effects are larger than the effects of student variables including student SES, as reported in a few large-scale studies both in US and Canada (Ma and Crocker, 2007; Ma and Willms, 2004).

*Classroom Instruction (CI)*. This variable incorporates teaching practices that research from three bodies of literature indicate are effective in enhancing student learning: high yield instructional strategies (e.g., Hattie, 2009; Marzano et al., 2001), data-informed instruction (e.g., Mandinach and Gummer, 2013; Pham, 2011; Schildkamp and Karbautzki, and Vanhoof, 2013), and technology use to facilitate face-to-face instruction.

Hattie’s (2009) meta-analysis identified a handful of variables associated with “high yield” instruction. Providing formative evaluation or assessment ( $d = 0.90$ ), tailored micro teaching ( $d = .88$ ), and providing prompt and detailed feedback ( $d = .73$ ) are among the most influential of those variables.

Using student data to inform instructional decisions has been identified as another key feature of successful Classroom Instruction (e.g., Crum, Sherman and Myran, 2009; Fuallan et al., 2006). Though some studies report no significant link between teachers’ data use and student learning (e.g., Prichett, 2008; gates, 2008; Hoover, 2009), the bulk of available evidence indicates

that increased use of formative and/or summative assessment data increases student achievement in various subjects (e.g., Dalton, 2009; Ferguson, 2009; Filbin, 2008; Gates, 2008; Hoover, 2009; Palucci, 2010; Rayor, 2010; Soslau, 2009; Williamson, 2012; Yao, 2009).

There is only limited evidence about the effectiveness of online learning for K–12 student. Means, Toyama, Murphy, Bakia, and Jones (2010) meta-analysis found a significant impact on learning using technology (about 0.2 average effect size). This effect was the result of blended rather than purely online approaches and parent-directed or collaborative uses of technology rather than independent, self-directed instruction. Technology is effective with children learning at home when it triggers learner activity or learner reflection and self-monitoring of understanding. The value of online learning is attributed to the expansion of learning time outside of school hours

*Teachers' Use of Instructional Time (UIT)*. Instructional time in formal classroom settings accounts for a large portion of public investment in student learning and is central component of effective schooling (OECD, 2102). Total instructional time matters less than how the time is spent, the subjects on which time is spent, and the strength of the curriculum (OECD, 2012). Time on task is an important contributor to achievement. The content of the curriculum in which students spend time studying, “opportunity to learn”, has quite strong effects on learning (Tornroos, 2005; Wang, 1998). Teachers' Use of Instructional Time includes teachers' efforts to maximize teaching and learning time, create classroom variables that allow for an appropriate pace of instruction, and help students take charge of their own learning in age-appropriate ways. The total amount of “time actually devoted to instruction” has moderate effects on student learning (e.g., Bellei, 2009). Time on task is an important contributor to achievement.

Based on the evidence summarized above about variables in the Rational Path, the original study anticipated and found that Academic Press and Disciplinary Climate contributed more than the other two variables on this path and contributed equally to the amount of variation in student achievement explained by the Rational Path. So, the first hypothesis for this study was:

*Hypothesis 1: AP and DC will contribute equally to the amount of variation in student achievement explained by the Rational Path, and significantly more than either UIT or CI.*

## **Variables on the Emotions Path**

*Collective Teacher Efficacy (CTE)*. This variable is defined as the level of confidence a group exudes in its capacity to organize and execute the tasks required to reach desired goals (Bandura, 1993; Goddard et al, 2004). Correlations between measures of CTE and student learning range from .38 to .99, with an average  $r = 0.69$  (e.g., Tschannen-Moran and Barr, 2004). Angelle and Teague (2014) report a strong relationship between teachers' sense of efficacy and the likelihood of them taking on leadership role in their schools. One recent study reported modest but significant relationships between CTE and the improvement of math instruction in middle schools (Berebitsky and Salloum (2017).

*Teacher Trust in Others (TTO)*. Common to most concepts of trust is one party's willingness to be vulnerable to another party based on the belief that the latter party is competent, reliable, open, and concerned (Tschannen-Moran and Hoy, 1998). Teacher Trust in Others in this study includes Teacher Trust in colleagues, school administration, students and parents. This variable has been linked positively to school effectiveness (Goddard, Tschannen-Moran, and Hoy, 2001), school climate (Hoy et al., 1996; Tarter et al., 1989) and student achievement (Leithwood et al., 2010), even when socioeconomic status and other student demographics (prior achievement, school SES, race, and gender) are controlled (e.g., Goddard et al., 2001).

*Teacher Commitment (TC)*. Evidence has accumulated about four types of Teacher Commitment: commitment to teaching, to students, to the school organization, and to change. This study measured only Teacher Commitment to the school organization because evidence suggests this type of commitment is most closely associated with student learning. Organizational commitment is about an individual's strong belief in the organization, identification and involvement in the organization, and a strong desire to remain a part of the organization (Freeston, 1987; Hushman, 1992; Leithwood et al., 1999; Porter et al., 1974).

Teacher Commitment contributes to teachers' instruction (Granger, et al., 2002; Hendel, 1995) and various student outcomes including, moral growth (Williams,1993), and academic achievements (Gill and Reynolds, 2000; Janisch and Johnson, 2003; Harvey, Sirna and Houlihan, 1999; Housego, 1999).

Evidence summarized above suggests that CTE and TTO contribute equally to the amount of variation in student achievement explained by the Emotions Path, the second hypothesis tested

in the first study. Results of the first study did not support that hypothesis, however. Reflecting those results, the second hypothesis in this study was:

*Hypothesis 2: CTE will contribute significantly more to variation in student achievement explained by the Emotions Path than either TTO or TC.*

### **Variables on the Organizational Path**

*Safe and Orderly Environment (SOE).* Assuming a holistic approach to school safety and orderliness, this variable relies on the coordination of school, parents, community and community services, efficient provision of mental health services for those students who need it, threat assessment rather than violence surveys, emphasis on prevention vs. suspension (on safe school vs. school violence), and increasing the use of restorative justice practices in progressive discipline (vs. retributive practices) (Astor, Guerra, and Acker, 2010; Borum, Cornell and Mayer, 2010; Mayer and Furlong, 2010; Modzeleski, and Jimerson, 2010; Swearer, Espelage; Vaillancourt, and Hymel, 2010). Providing an inclusive environment and inclusive instruction consistent with diverse learning styles and fostering students' self-efficacy is essential to the success of all students. This variable captures the features of both an orderly, safe environment and an inclusive environment.

*Collaborative Cultures and Structures (CCS).* This variable captures key elements of teachers' collaborative instructional knowledge sharing, creation and experimentation based on student progress data. One review (Sun et al., 2014) of data-use research revealed that teachers felt the opportunity to work with their colleagues, using common assessment to monitor student academic progress, engage in shared instructional decision-making and sharing best practices supported by formative assessment data, was an integral part of the process leading to increased academic scores. This feature is especially prominent in schools making significant progress with their students' achievement (e.g., Hill, 2010). Collaborative school culture and community has positive correlations with teacher perceived effectiveness in specialized programs for students with disabilities (Kristoff, 2003) and student achievement (Lomos et al., 2011).

*Organization of Planning and Instructional Time (OPIT).* This school variable includes two components: providing time and structure for teachers' common planning and maximizing instruction time at the school level. Common planning time is probably the support teachers need

most from school administration for collaboration and professional development. Teachers' developing common assessment tools, sharing effective assessments and teaching strategies, identifying students' need and developing interventions during common planning times has been reported as one prominent feature of successful schools - a typical way to improve 'social capital' in schools (DuFour and Fullan, 2013; Hargreaves and Fullan, 2013), and an effective way to move students forward (Leithwood, Aitken and Jantzi, 2006; Sharratt and Fullan, 2012; Sun et al., 2016). Across OECD countries, the average amount of time scheduled for learning is positively, but weakly, related to country average performance, while learning time in out-of-school-time lessons and individual study is negatively related to performance.

Limited access to collaborative planning time for teachers and limited time for targeted professional development created to carry out the demands related to instruction and curriculum, as well as the lack of formal structure and time dedicated to teachers' data use all hinder teachers from full engagement in precise or focused instruction (Deike, 2009; Gallagher, Means, Padilla and SRI, 2008; Quezada, 2012). In addition, collaborative data interpretation only seems useful when teachers feel that their time is not being wasted (Fischer, 2011).

Based on evidence about variables on the Organizational Path, the prior study anticipated that Organization for Planning and Instructional Time and Collaborative Cultures and Structures would contribute equally and significantly to variation in student achievement explained by the Organizational Path. Results of that study support part of this anticipation but neither variable contributed significantly to student achievement. Accordingly, our study stated a third hypothesis as:

*Hypothesis 3: While none of the variables on the Organizational Path will make significant, independent, contributions to student achievement, the contributions of OPIT and CCS will be larger than the contributions of either CCS or SOE.*

### **Variables on the Family Path**

The current study included concepts and measures much better aligned with relevant evidence than was the case in the original study. Three such variables are especially critical to student achievement.

*Parent Expectations for Children's Success at School and Beyond.* The variable was defined as "The degree to which a student's parents [hold] high expectations of the student's



promise of achieving at high levels” (Jeynes, 2005, p 246). Personally-held and challenging but achievable goals (or expectations) are at the heart of most contemporary theories of human motivation (e.g. Bandura, 1986). Many people, whether children or adults, either rise or fall to the level of expectations that valued others have for them; their own goals and sense of confidence about what is possible for them are, to a great extent, socially constructed. Jeynes’ (2005) meta-analysis identified “parental expectations”, among all forms of parental involvement in school, as having the greatest impact on student achievement by a large margin; a significant effect size of .58 (p.253).

*Forms of Communication between Parents and Children.* Schools typically spend considerable effort on creating meaningful ways of communicating with parents (Epstein et al, 2002) such as school newsletters, curriculum nights at school, online messaging systems and the like. However, it is the forms of communication between parents and children in the home that has by far the largest effect on student success at school. Underlying most such communication is what the literature refers to as “parenting styles.” (e.g., Jeynes, 2005). While it may seem presumptuous to view parenting styles as something schools might influence, the styles described in this literature are centrally defined by different approaches to communication between parents and their children. Creating effective parent/child communications necessarily entails clarifying with parents the advantages of adopting a supportive yet firm approach to interacting with their children, as compared with more extreme forms of either autocratic or laissez-faire approaches.

The more that parents and teachers share pertinent information with each other about students, the better equipped they are to help those students become successful. Parent and teacher consultation and collaboration create the climate for maximum realization of a student’s potential (Davis, 2000; Epstein, 1995). Overt, direct discussions of parenting styles between parents and school staffs may go beyond the boundaries of what some parents will accept from schools and what some school staffs will feel is a legitimate part of their role. However, schools can strive for parent engagement by tending to lead with their ears—listening to what parents think, dream, and worry about (Ferlazzo, 2011). The goal of family engagement is not to serve clients but to gain partners. Creating effective parent/child communications about school-related matters requires school staff to focus on how productive parenting styles are applied to obviously school-relevant issues (Leithwood and Patrician, 2015).

*Parents' Social and Intellectual Capital about Schooling.* This variable includes the power and information present in parents' social relationships that can be used to leverage additional resources helpful in furthering their children's success at school (Leithwood and Patrician, 2015). "The more people do for themselves, the larger community social capital will become, and the greater will be the dividends upon the social investment" (Ferlazzo, 2011, p.11). Parents' Intellectual Capital has been defined as the knowledge and capabilities of parents with the potential for collaborative action. Taken together, Parents Social and Intellectual Capital encompass parent engagement, involvement, and assistance in student learning and school activities. Parent engagement is nurtured when parents believe they should be involved in their children's education and schooling and have a positive sense of efficacy about the usefulness of their involvement (Hoover-Dempsey and Sandler, 1977, p.27).

Parent involvement in their children's learning is widely acknowledged as having a positive effect on student academic success (e.g. Fan and Chen, 2001; Harris, Andrew-Power and Goodall, 2009; Henderson and Mapp, 2002; Hoover-Dempsey et al, 2005; Mapp, 2002). While all students benefit from family involvement in education, the influence of parent engagement can mitigate differences in socioeconomic status (SES) and family background (Epstein and Dauber, 1991; Henderson and Mapp, 2002; Jeynes, 2005). Family participation is twice as predictive of students' academic success as family socioeconomic status (Bonci, Mottram, McCoy, and Cole, 2011). Some of the more intensive programs designed to encourage parent participation had effects that were 10 times greater than other relevant factors (Walberg, 1984). This evidence suggested a fourth hypothesis:

*Hypothesis 4: All three variables on the Family Path will explain significant amounts of variation in student achievement and PE will explain the largest amount of this variation.*

Weighing the strength of the evidence about variables on all four paths, along with evidence from the prior study, suggested an additional fifth hypothesis:

*Hypothesis 5: Of the total amount of variation in student achievement explained by the Four Paths, in aggregate, the Rational and Family Paths will explain similar and significant amounts of variation in achievement followed by the Emotions and Organizational Paths.*

## **School Leadership**

A considerable body of research conducted in both North America and the U.K. supports the conception of school leadership included in this framework (e.g., Leithwood and Riehl, 2005; Leithwood and Jantzi, 2006, 2008; Leithwood and Louis, 2010; Day et al, 2011). The most detailed account of this “integrated model” (Printy, Marks and Bower, 2010) and its’ theoretical roots is found in the *Ontario Leadership Framework* (Leithwood, 2012) recently judged to be the most comprehensive, evidence-based account of effective school leaders practices available (Hitt and Tucker, 2016). Including many of the practices associated with both instructional and transformational approaches to leadership, this model consists of four domains and a total of 21 specific practices within those domains.

Table 1 identifies the four domains of leadership practice - setting directions, building relationships and developing people, developing the organization to support desired practices and improving the instructional program; the table also lists the specific practices included in each domain. This conception of leadership and the evidence on which it is based closely reflects the meaning of the term “leadership for learning. Although not included in this study, the leadership model also includes three types of “personal leadership resources” (capacities and dispositions), cognitive, social and psychological resources (see Leithwood, 2012).

**[insert Table 1]**

A prior test of the four paths model (Leithwood, Patten and Jantzi, 2010) indicated very similar path coefficients between School Leadership and both the Rational and Organizational Paths. Relationships between School Leadership and the Emotions Path, although significant, were much weaker and there was no relationship between Leadership and the Family Path (although conceptualized and measured in a different way than in the current study).” (Hallinger, 2011; Knapp et al, 2010). Accordingly, our study included two final hypotheses:

*Hypothesis 6: School leadership will have significant direct effects on the Rational and Organizational Paths, a weak relationship with the Emotions Path and no significant direct effects on the Family Path.*

*Hypothesis 7: School leadership will have significant indirect effects on student achievement through the Rational and Organizational paths*

## **Methods**

### **Sample**

During the winter and spring of 2016 two surveys were administered to teachers and school leaders in all schools in six districts whose leaders were associated with the Rice University Education Entrepreneurship Program (REEP). Teacher data were used for this study. Responses sufficient for analysis at the school level were received from 81 schools. Of the 4523 teachers in those schools, 1779 provided valid responses (41% response rate).

### **Instruments**

*The Teacher Survey.* Using five-point Likert scales, the teacher survey (“The Teaching and Leading in Schools Survey”) measured teachers’ perceptions of the nature and quality of school leadership in each school, as well all variables included on the four paths described above. The six items used to measure school leadership reflected each of the five domains of the integrated leadership model described earlier. Previous uses of this measure report relatively high reliability (e.g., .93 in Leithwood and Louis, 2012).

Four variables represented the Rational Path. The 14 - item scale measuring Classroom Instruction was constructed for this study from the review of literature summarized in the Framework (above); it measures the use of high yield instructional strategies (e.g., Hattie, 2009) and attention to both student performance data (e.g. Pham, 2011), as well as instructional uses of technology. In its’ most recent use (Leithwood, Handford and Airini, 2017), this scale had an alpha coefficient of .76. A sample item from the scale measuring this variable is “I provide prompt, specific scaffolding or remedial feedback to provide more precise instruction to each of the students”.

The 5-item scale for measuring Academic Press (AP) was adapted from a scale used by Hoy and Tarter (1997) with an alpha coefficient of .94. A sample item from this scale includes “My school sets high standards for academic success”. Disciplinary Climate (DC) was measured with 6 items adapted from earlier research by Willms and Ma (2004), for example,

“Students do not start working for a long time after my lessons begin”. The reliability for this scale used in previous research ranged from 0.45 to 0.71 (Willms and Ma, 2004). Ten items developed specifically for this study were used to measure teachers’ Uses of Instructional Time (UOIT). A sample item is “My classroom timetable includes large uninterrupted blocks of learning time”. Previous uses of this scale report Alpha coefficient of .83 (Leithwood, Handford and Airini, 2017).

The Emotions Path was also represented by three variables. The 8-item scale for measuring Collective Teacher Efficacy (CTE), with an Alpha coefficient of 0.96, was based largely on a scale reported by McGuigan and Hoy (2006). A sample item is “Teachers in this school are confident they will be able to motivate their students”. The scale measuring Teachers’ Trust in parents, students, and colleagues (TT) was adapted from several different scales used by Tschannen-Moran (2001). This 6-item scale includes, for example, “Teachers can count on support from most students’ families”. The Alpha coefficient for this scale used in previous research ranged from 0.45 to 0.71 (Willms & Ma, 2004). The 6-item scale measuring Teacher Commitment (TC) was created from our own synthesis of literature on this topic and includes, for example, “I am willing to “go the extra mile” to help students.” The reliability of this scale used in our previous research was .94 (Leithwood, Handford and Airini, 2017).

The Organizational Path included three variables - Safe and Orderly Environment (SOE), Collaborative Structures and Cultures (CSC) and Organization of Planning and Instructional Time (OPIT) all measured using items based on our own review of prior evidence. The 6-item scale measuring SOE included, for example, “The learning environment in this school is safe and orderly.” An example from the 9-item CSC scale is “We collaborate with one another to develop common assessment tools for measuring students’ progress.” Finally, an example of the 4-item OPIT scale is “Teachers in our school have common planning times to discuss teaching and learning.”. As used in previous research, the scale had reliabilities of 0.77, 0.92 and 0.80 respectively (Leithwood, 2017).

The three variables representing the Family Path included Parent Expectations (PE), Forms of Communication between parents and children (FC) and Parents’ Social and Intellectual Capital (PSC) relevant to schools. The three scales measuring these variables originated in a previous study by the first author (Leithwood & Patrician, 2015). By way of

example, one item from the 5-item PE scale is “Most of my students’ parents or guardians make sure their children finish their homework”; one item from the 5-item scale measuring FC is “Most of my students’ parents or guardians listen to their children’s ideas.” and: one item from the 4-item PSIC scale is “Most of my students’ parents or guardians ensure that their kids have healthy diets and enough sleeps”. The reliability of these scales (aggregated) in recent research was 0.83 (Leithwood, Handford and Airini, 2017).

*Student achievement.* Student achievement data for each participating school was provided by the state’s testing program, the *Texas STAAR Percentage at Phase-in Satisfactory Standard or Above*, combing all subjects and all grades.

*SES.* Students’ socio-economic status, measured by EcoDis was based on the count and percentage of students eligible for free or reduced-price lunch or eligible for other public assistance (PEIMS, Oct. 2014, Oct. 2013; and TEA Student Assessment Division).

## **Analyses**

Means, standard deviations and scale reliabilities (Cronbach’s  $\alpha$ ) were computed for all variables and bivariate correlations were computed between all variables measured by the teacher survey. Intra-class correlations (ICC) were calculated using SPSS 24 ANOVA Random Effects for all path variables and school leadership to examine whether individual teacher measures of these clustered significantly at the school level. ICC (1) (representing the variance attributed to group membership), and ICC (2) (representing the within group agreement between teachers) were used to assess whether aggregation to the group level was-appropriate (Bliese, 2000; Mierlo, Vermunt, and Rutte, 2008).

Four confirmatory factor analyses (CFA) were conducted using LISREL 9.3. These CFAs aimed to determine whether each of the four paths could be considered a latent variable consisting of the three observed variables representing each path. Four multiple regression analyses were then used to determine the contribution of each of the four paths to student achievement under school leadership controlling for student SES.

Finally, structural equation modeling (SEM) using LISREL 9.3, was performed to examine the indirect effect of school leadership on student learning mediated by the Four Paths, controlling for student SES (Schumacker & Lomax, 2016).

## RESULTS

This section includes a summary of descriptive statistics and reliability coefficients for all variables (Table 2), correlations amongst all variables (Table 3), correlation amongst the Four Paths, school leadership, student achievement, and socio-economic status (Table 4), and justification for aggregation of the data to the school level (Table 5). Results of a Confirmatory Factor Analysis (CFA) of the four latent variables - Rational, Emotions, Organization, and Family Paths (Table 6 and Figure 2) are reported along with a discussion of the regression analyses examining the effects of student achievement on each of the Four Paths. Finally, results of an SEM path analysis are described; this analysis estimated the indirect effect of school leadership on student achievement mediated by the four paths (Table 6 and Figure 2).

### Responses to Survey

Table 2 reports the mean response to items measuring each of the variables (using a 5-point scale; 5 = strongly agree, 1 = strongly disagree), the standard deviation (SD) of these responses, reliability of the multi-item scales measuring each variable and the number of items included in each scale. As this table indicates, all scales exceed widely accepted minimum standards of reliability (.6 to .7) by a large margin, except for Organization of Planning and Instructional Time (.73).

Mean responses to scales ranged from lows of 3.54 and 3.75 for Parents' Social Capital and Parents Expectations for Student Success, respectively, to a high of 4.46 and 4.31 for Teacher Commitment and Classroom Instruction, respectively. The standard deviations of responses were all relatively low (.20 to .49), indicating substantial agreement among respondents' ratings. These descriptive results also indicate considerable variation in the status of key learning variables in schools.

[insert Table 2]

## Relations Among Variables

Correlations were calculated between all variables measured by the survey along with measures of student SES and achievement (Table 3). For purposes of this study, we focused on correlations with student achievement of each variable measured by the survey.

### [insert Table 3]

*Rational path.* Three of the four variables on the Rational Path are moderately correlated with student achievement (.42 to .56) but Classroom Instruction is essentially unrelated to achievement (.02). This variable was dropped from subsequent analyses.

*Emotions path.* Two of the three variables on the Emotions path (Collective Teacher Efficacy and Teacher Trust in Others) have similar, moderately high correlations with achievement (.52 and .50), correlations much larger than the correlation of Teacher Commitment with achievement (.30). However, the standard deviation of responses to this measure is quite small (.20) and might be responsible for the relatively low correlation with achievement of this variable.

*Organizational path.* There is a moderate correlation with achievement of a Safe and Orderly Environment (.46) whereas correlations with achievement are relatively small for both The Organization of Planning and Instructional Time (.24), and Collaborative Structures and Cultures (.25).

*Family path.* Correlations with achievement of the three variables on the Family Path are very similar and exceed, by a considerable margin, correlations with any of the variables on the other three paths. These correlations are .64 in the case of Parent Expectations for Student Success at School, .61 for Forms of Communication in the Home, and .68 for Parents Social and Intellectual Capital related to Schooling.

*School Leadership.* The correlation between school leadership and student achievement is relatively weak (.26), likely reflecting the indirect nature of school leadership influence. In contrast, correlations between school leadership and each of the Four Path variables range from moderate to quite strong; correlations between seven of the Four Path variables and school leadership exceed .60 while only three are below .40. School leadership is moderately related to the three variables on the Family Path, correlations ranging from .43 to .47.



We also examined the correlations amongst the Four Paths and their relations to school leadership, socio-economic status, and school achievement. The correlations amongst these variables were all statistically significant with the exception of school leadership correlation with socio-economic status ( $r = -.20, p > .05$ ).

**[insert Table 4]**

### **Intra-Class Correlation (ICC) Analysis**

Table 5 reports the result of ICC analysis. ICC (1) correlation is commonly interpreted as the proportion of variance in a target variable that is accounted for by group membership (Bliese, 2000; McGraw and Wong, 1996; Snijders and Bosker, 1999). ICC (2) represents the reliability of the group mean scores and varies as a function of ICC (1) and group size; it tests for homogeneity of perceptions among teachers within school. For a group-level construct to be reliable, ICC (1) values should be significant and the acceptable ICC (2) values should be larger than 0.60 (Cohen, Cohen, West, and Aiken., 2003).

**[insert Table 5]**

Thirteen random effect ANOVAs were run for the 12 path variables and school leadership ( $n=2017$ ). The F test of significance for each of the 13 variables was statistically significant ( $p < .001$ ). This confirmed the school level variability in the four observed variables and suggested that individual-level analyses would be inappropriate. The ICC (1) values for all the variables were small (from .10 for UIT to .30 for CTE), The ICC (2) values for the 13 variables were large (from .61 for OPIT to .89 for SL) except teachers use of instructional time, which was .56. These results indicated reliable within-group (school) agreement supporting the aggregation of data to the group level. Although the within-group agreement for teachers' use of instructional time did not exceed the 0.60 threshold recommended by Cohen et al. (2003), these results taken together indicated the appropriateness of aggregating the data to school level for data analysis.

### **Confirmatory Factor Analysis**

To test the hypothesis that the 12 path variables represent four latent constructs (the Four Paths), four confirmatory factor analyses were conducted. Factor loadings for variables on the Rational Path ranged from .74 to .91, on the Emotions Path from .76 to .97, on the

Organizational Path from .79 to .94 and on the Family Path from .86 to .97. All major fit indices confirmed acceptable model fit.

## **Regression Analysis**

We created four summative scale variables using the set of variables that represented each of the Four Paths in the CFA analysis. These four composite constructs were created by applying the factor loadings yielded from the four CFA measurement models. We ran four regression analyses based on the Four Path construct variables because we did not know how school leadership would influence student learning through any one path alone.

A series of regression analyses were conducted to estimate the contribution of each of the Four Paths to student achievement, as well as the contribution of the Four Paths, as a whole, including school leadership (Models 1 - 4). We first estimated the overall contribution of each of the Four Paths, controlling for student SES, using linear regressions. Then using stepwise regression, we identified the most influential variable impacting student learning among all the variables populated on each path. The final step estimated the overall impact of school leadership on student learning through the Four Paths combined (Model 5).

*Model 1 (The Rational Path)* Among the three variables on this path, Disciplinary Climate was the primary influence on student learning (counteracting the negative impact of students' economic status), followed by Use of Instructional Time.

*Model 2 (The Emotions Path):* Among the three variables on this path, regression analysis indicated that Collective Teacher Efficacy is the primary influence on student learning.

*Model 3 (The Organizational Path):* Results of the regression analyses indicate that SOE had larger impact on student learning ( $\beta = .18$ ) than either CCS ( $\beta = .06$ ) or OPTI ( $\beta = -.11$ ), though none of these impacts were significant, when students' SES entered into the equation.

*Model 4: The Family Path:* Regression analyses indicate that PSC had the largest impact on student learning ( $\beta = .26$ ) than either PE ( $\beta = -.08$ ) or FC ( $\beta = -.04$ ), although this impact was not significant, when students' SES was entered into the equation.

*Model 5 (The Four Paths):* In the final model, two approaches were followed. The first included only variables with the greatest influence on student learning as identified by the previous four models. These variables were entered into the equation together with SES and School Leadership.

The regression equation yielded from this approach indicated that, including SES, the Four Paths accounted for 69% of the variance in student achievement ( $F(6, 68) = 24.91, p < .001$ ). Of this variance, SES accounted for 62%. The only significant predictor of student learning among all path variables in this model was Disciplinary Climate; this was the result even when Disciplinary Climate was entered as the last path variable. The second approach conducted a regression analysis using the four construct variables, SES as the control variable, and School Leadership. This model explained 67% of the variance in student achievement. Only the Rational Path had a significant relationship with student achievement ( $\beta = .44; p = .00$ ) while the impact of SES was negative ( $\beta = -.69; p = .00$ ). The results from Models 1 – 5 helped our understanding of the results obtained when testing the hypothesized SEM path model.

### **Structural Equation Model**

A structural equation model was tested to assess the direct and indirect effects of the variables in the path model (Figure 2). The mediating variables were the Four Paths. School leadership was hypothesized to have direct effects on each of the Four Paths and indirect effects on student achievement through the mediating variables (Four Paths). The exogenous control variable, SES, was hypothesized to have a direct effect on student achievement and an indirect effect on student achievement through the mediating variables (Four Paths).

Results in Table 6 indicated that the Rational Path had a significant direct effect on student achievement ( $b = .42; p < .05$ ). School leadership had a significant direct effect on the Rational Path ( $b = .58; p < .05$ ) and SES had a significant direct effect on student achievement ( $b = -.68; p < .05$ ). The SEM path model had an acceptable model fit ( $\chi^2 = 0.13, df = 1; RMSEA < .05; GFI = .99$ ).

**[insert Figure 2]**

**[insert Table 6]**

The Emotional Path, Organization Path, and Family Path were not statistically significant. School leadership only impacted student achievement indirectly through the Rational Path. School leadership explained 35.8% of the variance in student achievement through the Rational Path, controlling for SES. .

## DISCUSSION AND CONCLUSIONS

Replication studies are relatively rare in the educational sciences, in general, and educational leadership studies, in particular ((Makel and Plucker, 2014). But the importance of replication has long been acknowledged (Nosek, 2015). This study is best classified as a partial replication, one aimed at generalizing results to a different policy and practice context (from Ontario to Texas schools).

Several features of the current study differed from the original study. The measure of SES used in this study was technically superior to the measure used in the first study. The conception and measure of the three variables on the Family Path was more comprehensive, as well as a better reflection of current evidence, than was the measure used in the first study. While the first study used math and language achievement data provided by Ontario's Educational Quality and Accountability Offices, the second study used the Texas Assessment of Academic Progress which sampled much broader achievement domains.

These differences strengthened the current study, as compared with the original. However, the current study relied on a smaller survey sample size (81 schools) than did the original; while the sample of teachers providing data for the study was quite large (1779), the school was the unit of analysis for the analyses. The 81 schools as aggregated data was appropriate for the analysis, however, subsequent research on the Four Paths model should aim to include data from at least 100 schools.

### **Synthesis of Evidence Testing the Seven Hypotheses**

Several types of evidence were used in our study to test the different hypotheses. This section brings together all evidence relevant to each hypothesis and indicates the level of support for each provided by results in the study.

*Hypothesis 1: AP and DC will contribute equally to the amount of variation in student achievement explained by the Rational Path, and significantly more than either UIT or CI.*

This hypothesis is partly supported by the results. Correlations with achievement are .56 for DC and .42 for AP. However, the correlation between UIT and achievement (.42) is the same as results for AP. The correlation of CI with achievement is just .02 and this variable

was dropped from additional analyses. Results of the regression analyses indicate that, among all three variables remaining on the Rational Path, DC was the primary influence on student learning (counteracting the negative impact of students' economic status), followed by UIT.

*Hypothesis 2: CTE will contribute significantly more to variation in student achievement explained by the Emotions Path than either TTO or TC.*

Results mostly confirm Hypothesis 2. While correlations with achievement are strongest for CTE (.52), the strength of that relationship is almost the same for TT (.50). The relationship between TC and achievement is considerably weaker (.30). Results of the regression analyses indicated that CTE was the primary influence on student learning confirming Hypothesis 2.

*Hypothesis 3: While none of the variables on the Organizational Path will make significant, independent, contributions to student achievement, the contributions of OPIT and CCS will be larger than the contributions of either CCS or SOE.*

Results partly confirm this hypothesis. There are medium to weak, but still significant, relations between all three variables and student achievement (OPIT = .24; CCS = .25; SOE = .46). Results of the regression analyses indicated that SOE had a larger impact on student learning ( $\beta = .18$ ) than either CCS ( $\beta = .06$ ) or OPTI ( $\beta = -.11$ ), although none of these impacts were significant, when students' SES was entered into the equation.

*Hypothesis 4: All three variables on the Family Path will explain significant amounts of variation in student achievement and PE will explain the largest amount of this variation.*

Results provided mixed support for this hypothesis. While correlations indicated that the three variables on the Family Path are strongly related to student achievement (.61 to .68); these are stronger correlations with achievement than is the case for variables on any of the other three paths. However, regression analyses indicated that PSC had a larger impact on student learning ( $\beta = .26$ ) than either PE ( $\beta = -.08$ ) or FC ( $\beta = -.04$ ), although the impact was not significant, when students' SES was entered into the equation.

*Hypothesis 5: Of the total amount of variation in student achievement explained by the Four Paths, in aggregate, the Rational and Family Paths will explain similar amounts of variation in achievement followed by the Emotions and Organizational Paths.*

Results of the regression analysis partly support Hypothesis 5. The final regression model that was conducted indicated that the Rational Path had significant relations with student achievement and School Leadership had a significant direct effect on the Rational Path ( $b = .58$ ;  $p < .05$ ). SES had a significant direct effect on student achievement ( $b = -.68$ ;  $p < .05$ ).

*Hypothesis 6: School leadership will have significant direct effects on the Rational and Organizational Paths, a weak relationship with the Emotions Path and no significant direct effects on the Family Path.*

Results provide only partial support for this hypothesis. The regression coefficients reported in Figure 2 indicated direct effects of School Leadership on all Four Paths - the Rational (.48), Emotions (.73), Organizational (.83) and Family Paths (.34).

*Hypothesis 7: School leadership will have significant indirect effects on student achievement through the Rational and Organizational paths.*

This hypothesis was only partly supported. The SEM analysis indicated that the indirect effects of School Leadership on student achievement are achieved only through the Rational Path (Figure 2). So whatever school leaders do to influence variables on the other paths, the goal of such influence should be to ensure improvement in the Rational Path - AP, DC and UIT variables (Table 1). These results call for a significant modification of the relations among The Four Path variables in the theoretical model.

### **Other Key Results and Implications**

Arising from the results of our hypotheses are five key results with significant implications for future research and practice.

*More complex interactions among variables.* The version of the Four Paths Model tested in this study assumed significant direct effects on achievement of all four paths, along with unspecified interactions among paths. Results indicated, however, that only the Rational Path had a direct effect on student achievement. The other paths influenced achievement through their

influence on the Rational Path. These results raise questions about whether and how specific variables on the Emotions, Organizational and Family Paths influence DC, AP and UIT. For example, do changes in CTE have an influence on AP and if they do what are the mechanisms connecting the two?

Logically, there are many such questions (27 - a total of nine variables on the Emotions, Organizational and Family paths and three variables on the Rational Path). A careful analysis of existing research reveals fairly robust answers to some of those questions (the question above, for example) but certainly not the majority. So, one important direction for future theory and research would entail unpacking the complex relationships between variables on the Rational Path and variables on the other three paths. This might be done, for example, by creating and testing theories of action relevant to each question, that is, chains of if-then claims aimed at uncovering the mechanisms linking Four Path variables.

*Reduction of Variable Overload.* Results indicated very strong relationships between the three sets of variables on each Path, suggesting that improving any single variable on a Path might potentially lead to improvement in other variables on the same path. While considerable amounts of prior conceptual and empirical work justify the independence of each variable on the Four Paths, our success in treating each path empirically, as a single latent variable, potentially points to shared underlying features that have not yet been the focus of much exploration. Future research identifying those underlying qualities would help reduce the confusion of information now faced by leaders wanting to base their practices on good evidence.

The extensive work by Hoy and his colleagues (e.g., Hoy, Tarter and Hoy, 2006) resulting in justification for a variable labelled “Academic Optimism” is perhaps the most mature example of this type of research available. As a second example, we have recently reported research on another promising latent variable we label “Academic Culture” (Leithwood and Sun. in press); it is a composite of the three variables on the Rational Path. Focus and opportunity are the primary theoretical grounds on which we justify our research on Academic Culture. Academic Press and Disciplinary Climate focus teachers and students alike on the school’s academic goals and help minimize distractions from working toward those goal. Using most of the instructional time in the classroom for teaching and learning, without many other distractions, increases the chances for students to be meaningfully engaged in achieving those academic goals.

*Assessing Relative Effects.* Most research about the 12 individual variables on the Four Paths has been single-variable research. Most studies of TTO, for example, examine its effects on student achievement without assessing the effects of TTO in comparison with the effects of, for example, CTE. Such single-variable research likely overestimates the independent contribution to achievement of each individual variable. In multi-variable studies (such as this one), each variable has to share the total explained variation with other variables and take its chances on the order in which variables are entered into regression equations. Focusing more future effort on multi-variable research would help build an evidence base about explanations for variation in student achievement that reflect a much broader horizon than does most of the current evidence base.

Research of this type would have considerable practical value, as well, allow for “optimizing” rather than “satisficing” forms of school improvement decision making. As we have argued elsewhere (e.g., Leithwood and Sun, 2016), school leaders’ improvement work entails making choices about the small number of conditions (variables) in their schools on which they are able to focus their energies at any point in time. So, studies which examine the relative contribution to student success of the several or more variables of interest at the same time seems to produce a better estimate of the real-world effects of any one variable.

*The insignificant effects of classroom instruction.* Perhaps the most surprising result of the study was the lack of a relationship ( $r = .02$ ) between Classroom Instruction and student achievement. In fact, this is no surprise to us since we have encountered it in the results of three relatively recent studies using the same or similar measurement scales (Leithwood and McCullough, 2017; Leithwood, Handford and Airni, 2017; Leithwood and Sun, 2016).

One possible explanations for such a weak correlation might be the content of the scale used to measure the variable, but it was built on a careful review of the best available evidence about effective classroom instruction. A second possible explanation is difficulty teacher respondents have in assessing the nature of their own instruction. This is a very plausible explanation; in an earlier project (unpublished) using a very similar measurement scale, we found principals’ estimates of their teachers’ classroom instruction to be much more strongly related to student achievement than their teachers’ estimates of their own instruction. Finally, the standard deviation of this scale was relatively small, and this undoubtedly had some impact on the size of the correlation with achievement.



We are especially intrigued, however, by a fourth explanation – AP, DC and UIT are more powerful influences on student achievement than small variations in the quality of teachers’ instruction. This seems an especially plausible explanation, at least in school contexts which have already devoted sustained attention to teacher professional development aimed at improving the quality of their instruction but have devoted little sustained attention to the other three Rational Path variables. School leaders aiming to improve the educational experiences of their students would be advised not to restrict their attention to improving the quality of instruction at the expense of getting the most of improving AP and DC, as well as maximizing the instructional uses of time in their teachers’ classrooms. Continuing efforts to squeeze ever more student achievement out of improvements to classroom instruction may be pushing against the law of diminishing returns. Other options should be considered.

In sum, results of this study provided either full or partial support for the hypotheses used to test the SEM Four Paths Model. Results also pointed toward a more nuanced and complex set of relationships among variables included in the model than the original version had specified. Better understanding of these more complex relationships will require considerable additional research, but the results of that research would likely be of substantial practical value to school leaders’ improvement when guided by The Four Paths Model.

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**Table 1. School Leadership Domains and Practices**

<b>Domains of Practice</b>	<b>Specific Practices</b>
Set Directions	<ul style="list-style-type: none"> <li>• Build a shared vision</li> <li>• Identify specific, shared, short-term goals</li> <li>• Create high-performance expectations</li> <li>• Communicate the vision and goals</li> </ul>
Build Relationships and Develop People	<ul style="list-style-type: none"> <li>• Stimulate growth in the professional capacities of staff</li> <li>• Provide support and demonstrate consideration for individual staff members</li> <li>• Model the school’s values and practices</li> <li>• Build trusting relationships with and among staff, students and parents</li> <li>• Establish productive working relationships with teacher federation representatives</li> </ul>
Develop the Organization to Support Desired Practices	<ul style="list-style-type: none"> <li>• Build Collaborative Cultures and distribute leadership</li> <li>• Structure the organization to facilitate collaboration</li> <li>• Build productive relationships with families and communities.</li> <li>• Connect the school to its wider environment.</li> <li>• Maintain a safe and healthy school environment</li> <li>• Allocate resources in support of the school’s vision and goals</li> </ul>
Improve the Instructional Program	<ul style="list-style-type: none"> <li>• Staff the instructional program</li> <li>• Provide instructional support.</li> <li>• Monitor student learning and school improvement progress</li> <li>• Buffer staff from distractions to their instructional work</li> </ul>

**Table 2. Mean, Standard Deviation and Scale Reliability for Variables**

<b>Variables</b>	<b>Mean</b>	<b>SD</b>	<b>Reliability</b>	<b>N of Items</b>
<b>Rational Path</b>				
Use of Instructional Time	3.93	.27	.83	6
Academic Press	3.76	.40	.85	4
Disciplinary Climate	3.74	.46	.85	4
Classroom Instruction	4.31	.21	.86	8
<b>Emotional Path</b>				
Teacher Commitment	4.46	.20	.86	6
Teacher Trust in Others	3.68	.46	.86	5
Teacher Collective Efficacy	3.83	.47	.96	8
<b>Organizational Path</b>				
Org. of Planning and Instructional Time	4.02	.34	.73	4
Safe and Orderly Environment	3.83	.36	.86	6
Collaborative Cultures and Structures	3.81	.36	.92	9
<b>Family Path</b>				
Parent Expectations	3.75	.49	.90	5
Forms of Communication	3.81	.53	.89	5
Parents' Social and Intellectual Capital	3.54	.59	.94	8
<b>Leadership</b>				
School Leadership	3.83	.42	.98	22
<b>Student Achievement</b>	76.36	13.36	n/a	n/a
<b>Student Social Economic Status</b>	58.52	28.46	n/a	n/a

Note: n = 81

**Table 3. Correlations Between all Path Variables**

Variables	UIT	AP	DC	TC	CTE	TTO	PIT	SOE	CCS	PE	FC	PSC	SL	SES
Use of Instructional Time (UIT)														
Academic Press (AP)	.67**													
Disciplinary Climate (DC)	.66**	.81**												
Teacher Commitment (TC)	.65**	.69**	.67**											
Collective Teacher Efficacy (CTE)	.54**	.81**	.88**	.74**										
Teacher Trust in Others (TTO)	.57**	.83**	.72**	.64**	.81**									
Org. Planning & Instructional Time (PIT)	.60**	.70**	.54**	.70**	.64**	.72**								
Safe and Orderly Environment (SOE)	.59**	.81**	.78**	.74**	.87**	.83**	.75**							
Collaborative Cultures & Structures (CCS)	.58**	.65**	.39**	.62**	.47**	.77**	.75**	.63**						
Parent Expectations (PE)	.45**	.69**	.74**	.42**	.74**	.75**	.50**	.65**	.35**					
Forms of Communication (FC)	.33**	.61**	.57**	.33**	.65**	.74**	.42**	.60**	.39**	.81**				
Parents' Socl & Intelctl. Capital (PSC)	.36**	.62**	.63**	.36**	.69**	.75**	.41**	.62**	.38**	.83**	.91**			
School Leadership (SL)	.41**	.71**	.56**	.69**	.69**	.80**	.77**	.76**	.78**	.47**	.45**	.43**		
Social Economic Status (SES)	-.23*	-.33**	-.43**	-.16	-.44**	-.50**	-.20	-.40**	-.21	-.71**	-.63**	-.69	-.20	
Student Achievement (SA)	.42**	.42**	.56**	.30**	.52**	.50**	.24**	.44**	.25*	.64**	.61**	.68**	.26**	.78**

\*Correlation is significant at the .05 level (2-tailed); \*\* Correlation is significant at the .01 level (2-tailed).

**Table 4. Correlations Between the Four Path Composite Constructs**

Variables	SL	SES	Ration	Emotion	Orgnztn	Family
School Leadership (SL)						
Social Economic Status (SES)	-.20					
Ration	.64**	-.39**				
Emotion	.80**	-.45**	.88**			
Organztn	.85**	-.30**	.77**	-.87**		
Family	.47**	-.71**	.67**	.75**	.56**	
Student Achievement (SA)	.24**	-.78**	.52**	.49**	.33**	.64**

\*Correlation is significant at the .05 level (2-tailed); \*\* Correlation is significant at the .01 level (2-tailed).

**Table 5. Intraclass Correlation Coefficients for Path Variables and School Leadership**

Variables	ICC1	ICC2	F-ratio
AP	.25	.86	7.03***
DC	.27	.87	7.76***
UIT	.10	.56	2.29***
CTE	.30	.89	9.12***
TTO	.29	.88	8.23***
TC	.14	.71	3.44***
SOE	.23	.81	5.86***
CSC	.17	.75	4.03***
OPIT	.18	.61	4.61***
PE	.29	.88	3.32***
FC	.15	.72	3.55***
PSC	.24	.84	6.13***
SL	.26	.80	4.99***

Note:  $n = 2815$ ; \*\*\* indicates  $p < 0.001$

**Table 6. Indirect Impact of School Leadership on Student Learning Through the Rational Path**

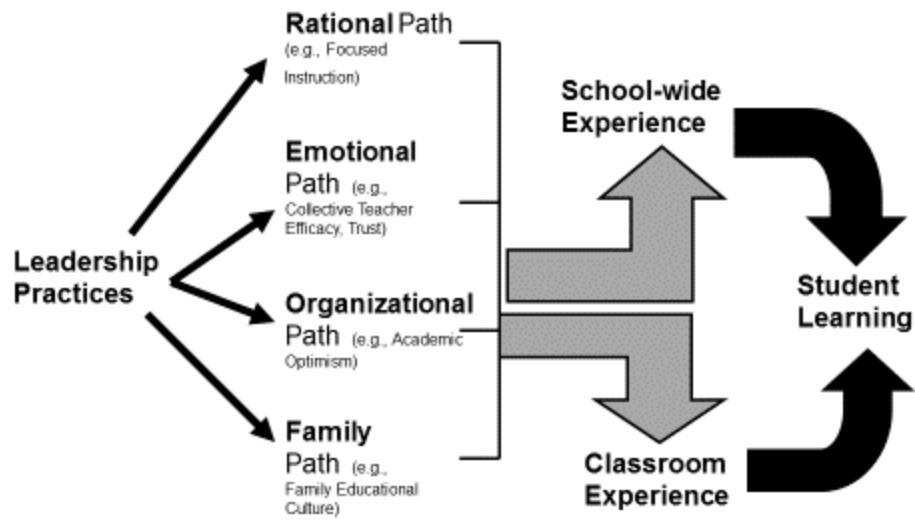
Path	Standardized Estimates	Unstandardized Estimates	SE	Critical Ratio
<i>Direct effects</i>				<i>t-value</i>
Ration → SA	.42	5.49	1.74	3.15
SL → Ration	.58	1.39	.20	7.05
SES → Ration	-.27	-.01	.00	-3.26
SES → SA	-.68	-.32	.04	-7.45
<i>Indirect effects</i>				
SL → Ration → SA	.24	7.63	2.68	2.88
SES → Ration → SA	-.11	-.27	.08	-2.27

Note:  $t > 1.96$  significant at  $p < .05$ .





**Figure 1: Four Paths of Leadership Influence on Student Learning**



**Figure 2: The Impact of School Leadership on Student Achievement Through the Four Paths**

