Chapter 5
Effects of Distributed Leadership on School Academic Press and Student Achievement

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This study inquired about the effects of distributed leadership (Mascall et al. 2009) on teachers' academic optimism and students' math and language achievement. While leadership practices exercise a significant influence on student achievement, considerable evidence now indicates that such influence is mediated by internal school processes. (Hallinger and Heck 1996; Leithwood 2006; Robinson et al. 2008; Robinson and Timperley 2007). A growing body of evidence also argues for the increased impact of leadership practices enacted in a distributed fashion (Harris 2008).

Academic optimism is a composite variable including three factors, each of which has been associate positively with student achievement, including teacher commitment (e.g., Tschannen-Moran and Barr 2004; Ross and Gray 2006), teacher trust in clients (e.g., Bryk and Schneider 2002; Goddard et al. 2001) and academic emphasis or press (e.g., Lee and Smith 1999). Not surprisingly in light of such evidence, a growing body of research about academic optimism has also reported significant associations with achievement (Bevel and Mitchell 2012; Boonen et al. 2014; Hoy et al. 2006, 2008; Kirby and DiPaola 2011; Mitchell and Tarter in press; Smith and Hoy 2007; Wu et al. 2013). Distributed leadership is one plausible expression of the "enabling school structures" reported to be significant antecedents of academic optimism (Mitchell and Tarter in press; Tschannen-Moran 2009).

This study aimed to address three research questions. Do some patterns of distributed leadership have greater effects on academic optimism than others? To what extent does academic optimism mediate the effects of distributed leadership on student achievement? Which patterns of distributed leadership have the greatest effects on academic optimism and academic achievement?

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5.1 Framework

Summarizing the framework guiding the study, Fig. 5.1 proposes that four different patterns of distributed leadership (DL) each have direct effects on academic optimism (AO) and AO has direct effects on both the math and language achievement of students. The average socio-economic status (SES) of a school's students influence the status of each of the three primary variables in the study as well as moderate their relationships.

5.1.1 Patterns of Distributed Leadership

The bulk of research on distributed leadership in schools describes what such leadership amounts to in practice (Bennett et al. 2003; Gronn 2002; Harris et al. 2007; Harris and Spillane 2008; Leithwood et al. 2008; MacBeath 2005; Spillane 2006; Timperley 2005a). Distributed leadership is leadership practice shared by many (Harris 2003; Heller and Firestone 1995; O'Day 2002; Plowman et al. 2007; Spillane et al. 2007; Spillane and Diamond 2007; Timperley 2005b, 2008) and practiced in the "interactions between leaders, followers and their situation" (Spillane 2006, p. 26). Distributed leadership focuses attention on the expertise that individuals possess rather than the formal position they may hold (Anderson et al. 2008; Bennett et al. 2003; Heller and Firestone 1995; Leithwood and Jantzi 2006) and on how those providing leadership interact to provide such leadership to their organizations.

Distributed leadership is not simply a different form of delegation (Penlington et al. 2008). Delegated leadership typically means that the full array of leadership tasks that need to be performed are assigned to others, each of whom will typically enact them independently of others. Distributed leadership is not about people working independently on tasks that the formal leader has requested. Distribution of leadership implies that a network of individuals is working more or less interdependently to enact leadership practices toward a common goal. This network is strengthened through processes that focus their collective work and their learning (Halverson

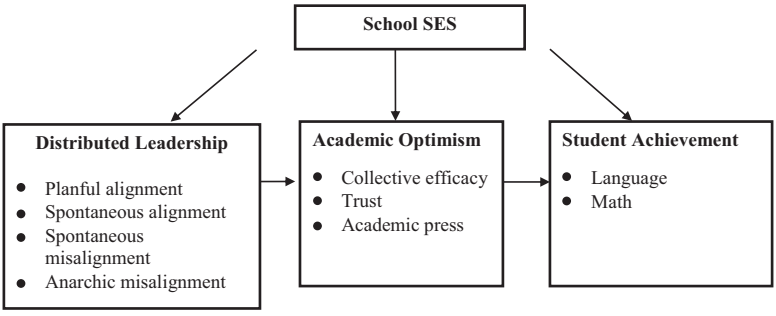


Fig. 5.1 Conceptual framework

2007) such as inquiry processes between teachers that enhance teacher capacity (Copeland 2003).

Leadership practices are distributed in distinctly different ways in schools, so identifying these different patterns is a critical part of research on distributed leadership effects. Different patterns may have different effects. There is, however, little consensus about how best to classify and describe such variation in leadership distribution. For example, one review (Leithwood et al. 2008) found .that patterns identified in the literature to date focused variously on five different classifications of patterns based on:

- the range of organizational members to whom leadership is distributed
- the degree to which distributed forms of leadership are coordinated
- the extent of interdependence among those to whom leadership is distributed
- the extent to which power and authority accompany the distribution of leadership responsibilities
- the stimulus for leadership distribution (Leithwood et al. 2008).

This study explored the effects[1] of four patterns identified during the first stage of a larger project within which this study is a subset, patterns based on the degree to which the distribution of leadership practices is coordinated. These patterns are labeled planful alignment, spontaneous alignment, spontaneous misalignment, and anarchic misalignment (for the evidence used to identify these patterns see Leithwood et al. (2007) and Mascall et al. (2009). The evidence used to identify these four patterns also found positive effects on teachers and students of only one of the patterns, planful alignment; the other three patterns actually had negative effects.

Planfully aligned distributed leadership exists when reflection and dialogue are the basis for decision making, when trust in the motivations and capacities of one's colleagues is present, when everyone understands their own and each other's role in the organization and when cooperation rather than competition described how people work together (Leithwood et al. 2007). When distributed leadership is planfully aligned, "the various sources of leadership consider which leadership practices or functions are best carried out by which source" (Mascall et al. 2009, p. 7). This study was also part of the second stage of this multi-step study which examined which patterns of distributed leadership matter most to student achievement

Planfully aligned distributed leadership relies on clear role clarification, effective communication, a defined understanding of the accountabilities that exist, and an understanding of who on staff possesses various expertise (Day and Leithwood 2007). A coherent vision must be maintained in the schools (Mayrowetz et al. 2008) and a common culture is needed to promote effective practice (Elmore 2000). Planfully aligned distributed leadership means that those who are the sources of leadership in the school determine which leadership practices and functions are

[1] The terms "effects" and "impacts" are used throughout the study even though evidence from the study is correlational in nature, supporting only weak causal claims. The study's use of the terms "effects" and "impacts" is consistent with widely accepted reporting conventions for analyses such as those included in this study

needed and who will exercise these functions and practices at any given time (Leithwood et al. 2007; Mascall et al. 2009).

5.1.2 Academic Optimism

A small but compelling line of research has found that when teachers a) possess a strong sense of collective efficacy, b) trust parents, students, their fellow educators and leaders, and c) believe that all students have the potential to succeed (academic press), a significant contribution is made to student achievement (Hoy et al. 2006; McGuigan and Hoy 2006; Smith and Hoy 2007). These three factors, collective efficacy, trust and academic press, considered together, form the variable Hoy et al. (2006) have labeled academic optimism.

Collective Efficacy The concept of collective efficacy is based in social cognitive theory about self-efficacy (Bandura 1986). Self-efficacy, a form of self-reflection which Bandura believes mediates knowledge and action, is defined as "people's beliefs in their capabilities to mobilize the motivation, cognitive resources and courses of action needed to exercise control over events in their lives" (Wood and Bandura 1989, p. 364). When people experience self-efficacy, they engage in challenging activities for a longer period of time and persevere more often when facing challenges compared to those who may have the knowledge and skills but lack this belief in their own capability (Wood and Bandura 1989).

Self-efficacy and collective efficacy are closely related (Goddard et al. 2000a) and the sources of collective efficacy are the same as the sources of self-efficacy: mastery experience, vicarious experience, verbal persuasion and physiological states of arousal (Goddard et al. 2000b). Learning takes place in different ways: through mastery experiences in which the learner engages directly; through vicarious experience which usually involves modeling by someone with greater capacity in a certain area; through verbal persuasions which are verbal judgments that must be perceived by the learner as authentic and the goals communicated through these persuasions must be perceived as attainable; and through physiological states which may be characterized as anxiety, stress, fatigue, satisfaction and calm (to name a few examples) which impact the environments in which we live (Bandura 1986; Wood and Bandura 1989).

Potentially, in a school with a strong sense of collective efficacy, teachers model for each other. In these schools, the norm is to share responsibility, to make commitments based upon shared beliefs and to learn from each other (Goddard et al. 2000a; Tschannen-Moran and Barr 2004). The perception teachers hold of themselves and of their colleagues will influence their actions. These actions will be judged by the group relative to group norms. In this way, collective efficacy impacts personal perceptions and group norms and these perceptions and norms impact actions (Goddard et al. 2000a, b). High-quality teaching must be internalized in the professional culture of schools. In other words, where collective efficacy exists, teachers

may exhibit the ability to persevere and together they accept the challenges they face to improve student achievement for all students. Where there is a strong sense of collective efficacy, evidence suggests that teachers are more likely to maintain high standards, to concentrate on academic instruction, to monitor on-task behaviour and to build friendly, non-threatening relationships with students (Ashton et al. 1983).

Trust There is a positive correlation between teachers' sense of efficacy and trust between teachers and teachers, teachers and students, and teachers and parents (Tschannen-Moran and Barr 2004). Hoy et al. (2006) define trust as "one's vulnerability to another in terms of the belief that the other will act in one's best interest" (p. 429). When trust in schools means that staff is willing to be vulnerable to each other based on the belief that everyone in the community is benevolent, reliable, competent, honest, and open (McGuigan and Hoy 2006). Where there is a significant sense of trust, teachers report that they feel supported, they feel their interests are reflected, and they are involved in decision making (Louis 2007). The relationship between distributed leadership and trust is mutual and dynamic (Smylie et al. 2007).

Trust is a necessary component for school improvement (Bryk and Schneider 2002; Tschannen-Moran and Hoy 1998) because without it, teachers would not feel compelled to work together to bring about change (Louis 2007), nor would there be the ability to challenge existing structures where necessary (Regine and Lewin 2000). Systemic change is not possible without trust (Louis 2007). Schools with relational trust are more likely to implement changes that might be attributed to improved student achievement. By examining 400 Chicago elementary schools over a 10-year period, Bryk and Schneider (2002) concluded that relational trust consists of respect, competence, personal regard for others and integrity and that the success of any reform that is needed in schools hinges upon the degree of relational trust that exists in these schools.

Evidence suggests that trust impacts teacher commitment (Bryk et al. 1999) and where trust is present, teachers are more willing to engage in vicarious learning (Goddard et al. 2000a, b). Vicarious learning is an effective way to build collective efficacy because teachers are willing to learn from the expertise of others. This is another indicator of the explicit connection between trust and collective efficacy. Trust is also a foundational element for professional learning communities. Trust is developed when teachers share ideas with one another and through this experience, the members of the professional learning community gain the reputation as being trustworthy (Halverson 2007). Trust and cooperation are products of common learning goals shared by students, parents and teachers, and teaching and learning improve when trust exists (Hoy et al. 2006).

Trust in schools may improve student achievement. According to Hoy et al. (2006), "trust and cooperation among students, teachers and parents influenced regular student attendance, persistent learning, and faculty experimentation with new practices" (p. 430). Trust is a necessary ingredient that assists teachers to learn from one another about how to meet the needs of each student in the school. Trust between teachers and especially elementary students, which is highly correlated with the trust between teachers and parents, allows teachers to be innovative without worrying about paren-

tal response because cooperation between parents and teachers for the sake of the students is so strong (Hoy et al. 2006). Trust between teachers and teachers, teachers and students, and teachers and parents, potentially allows common learning goals to be created and achieved, leading to improved student achievement.

Academic Press Academic press, the third component of academic optimism, includes high expectations that are communicated by teachers to students about their academic efforts. Academic press is evident when schools make academic achievement their central purpose (McGuigan and Hoy 2006), and when teachers believe that students are capable of academic success regardless of their learning styles and needs (Anderson 2008). Further, academic press is evident when high yet achievable goals are set for students, students work hard and the culture in the schools assists students to respect academic achievement (Hoy et al. 2006).

Academic press or emphasis is associated with improved student achievement even when controlling for socio-economic status (Hoy et al. 2006). Indeed, some evidence indicates that "academic emphasis, rather than instructional leadership [is] the critical variable explaining achievement" (2006, p. 427). According to Bandura, there is a reciprocal relationship between academic press and student achievement (Bandura 1997). As student achievement improves, teachers increase academic press which further enhances student achievement.

Collective efficacy, trust and academic press together form the variable academic optimism. Evidence suggests that high levels of academic optimism contribute to student achievement across schools serving students with widely varying family backgrounds (Hoy et al. 2006) This variable has a cognitive function (collective efficacy) which speaks to how teachers perceive their own skills; an affective function (trust) which speaks to the important relationships between teachers and parents, students, others teachers and administrators; and a behavioral function (academic press) which speaks to the way teachers demonstrate their expectations for students to achieve (Smith and Hoy 2007). These three components, Hoy et al. (2006) claim, enhance each other to create effective conditions for learning in schools.

Three studies provide evidence to support the claim that a significant correlation exists between academic optimism and student achievement. (Hoy et al. 2006; McGuigan and Hoy 2006; Smith and Hoy 2007). Hoy et al.'s study (Hoy et al. 2006) was conducted with a sample of 96 high schools in a Midwestern U.S. state. Results of this study suggested that academic optimism was strongly related to a student achievement at the organizational level. Smith and Hoy (2007) explored the relationship between academic optimism and student achievement in elementary schools using a sample of 99 urban elementary schools in Texas. This study found significant relationships between improvement of student achievement in mathematics and academic optimism (Smith and Hoy 2007). The authors contend that "Academic optimism is a powerful motivator because it focuses on potential with its strength and resilience rather than pathology with its attendant weakness and helplessness" (p. 567).

McGuigan and Hoy (2006) explored the enabling structures that enhance academic optimism in a school. Teachers in 40 elementary schools in Ohio were sur-

veyed to measure the levels of academic press, trust and collective efficacy in a school. The results of this study suggest that academic optimism is an organizational variable that improves student achievement and that enabling structures support the enhancement of academic optimism (McGuigan and Hoy 2006).

Students' Socio-economic Status Poor student achievement has often been attributed to low socio-economic status (SES). The Coleman report (Coleman et al. 1966) spoke about the negative consequences of low SES on student achievement citing that the characteristics of the school had a minimal effect on student achievement in the face of socio-economic challenges. Researchers have attempted to disprove this theory for decades and the research on academic optimism has contributed to this body of research (Hoy et al. 2006; McGuigan and Hoy 2006).

Boonen et al. (2014) "school mean socioeconomic status and school mean prior achievement are mainly indirectly associated with student achievement through academic optimism".

Wu et al. (2013) SES not related to student achievement in this study conducted in Taiwan but it was negatively related to academic optimism.

Bevel and Mitchell (2012) SES negatively related to all variables in the study including academic optimism and its components , as well as student achievement.

Kirby and DiPaola (2011) Academic optimism is negatively related to academic optimism ("teacher attitudes about students from low SES homes affects the academic optimism of a faculty" page554. 74% of the variance in student achievement explained by academic optimism

Hoy et al. (2006) Academic optimism made a significant contribution to student achievement after controlling for demographic variables and previous achievement. Effects on achievement were approximately the same for SES and Academic optimism

5.2 Methods

5.2.1 Sample

The population for this study was all 4450 teachers in 165 elementary schools in an Ontario school district with a long standing commitment to distributed leadership. Because of this commitment, there could be a greater chance that distributed leadership in some form would have been experienced by the survey respondents. This school district served students in urban, suburban and rural areas and the socio-economic demographic of the families served by this school district varied widely. The district served more than 70,000 elementary students. This study was part of the

second phase of a distributed leadership research project conducted in this district over 3 years.[2]

Those schools in which at least six teachers responded to the survey were included so the achieved sample for the study was 2122 (47% response rate) elementary teachers located in 113 schools (68% response rate). The school was the unit of analysis used for answering all research questions.

5.2.2 Instruments

Data for this study were collected through a survey instrument administered to teachers, as well as evidence about student achievement data provided by Ontario's Education Quality and Accountability Office test (EQAO). Socio-economic status (SES) data for each school were provided by Statistics Canada and further refined by the district itself.

The teacher survey requested information about academic optimism, patterns of leadership distribution in their schools and factors assumed to influence such distribution. Items on the survey, using a seven-point response scale, were adapted from: the measure of academic optimism used by Hoy and his colleagues (Hoy et al. 2006; Hoy and Fedmen 1987; McGuigan and Hoy 2006; Smith and Hoy 2007); the measures of trust in leaders developed by both Podsakoff et al. (1990) and Bryk and Schneider (2002); the measure of trust between teachers developed by Bryk and Schneider (2002); the measure of collective efficacy by Ross et al. (2004); and the measure of distributed leadership used by Mascall et al. (2009). Specific items measuring academic optimism are described in Table 5.1.

One statement on the survey was used to measure each of four patterns of leadership distribution: planfully aligned, spontaneously aligned, spontaneously misaligned and anarchically misaligned distributed leadership. For planfully aligned distributed leadership the statement was: Leaders across this school collectively plan who should perform which leadership functions and they tend to follow the arrangements. For spontaneous alignment the statement was: Leadership tasks in this school are distributed with little or no planning. This distribution, however, is usually productive. For spontaneous misalignment the question was: Leadership tasks in this school are distributed with little or no planning. This distribution is not productive and often leads to confusion. For anarchical misalignment the statement was: Leaders coordinate their work carefully within their sub-units (divisions, departments, teams) but they do not coordinate their work with other sub-units.

The survey also requested demographic information about each respondent: including grade(s) taught, number of years in the present school, years of experience in education, grades included in the respondents' schools and the enrolment in

[2] This study is a secondary analysis of evidence collected by a study of distributed leadership led by Dr. Ken Leithwood. I was part of the team that designed the study and the analyses in this thesis extends beyond the analysis completed as part of the original project.

Table 5.1 Survey questions for academic optimism and each of its components

Academic optimism
Trust in leaders
1. I feel quite confident the leaders at my school always try to treat me fairly
2. I feel a strong loyalty to our school leaders
3. I would support the leaders at my school in almost any emergency
4. It's ok in this school to discuss feelings, worries and frustrations with school leaders
5. Leaders in our school look out for the personal welfare of teachers in this school
Trust in teachers
6. Teachers in this school really care about each other
7. Teachers in this school really trust each other
8. It's OK in this school to discuss feeling, worries and frustrations with other teachers
9. Teachers in this school respect colleagues who take the lead in school improvement efforts
Collective efficacy
10. If a student doesn't learn something the first time, teachers in this school will try another way.
11. Teachers in this school really believe every student can learn
12. If a student doesn't want to learn, most teachers here give up (R)
13. Teachers in my school need more training to know how to deal with the students who aren't learning.(R)
14. Teachers in my school don't have the skills needed to produce meaningful student learning. (R)
Academic press
15. My school sets high standards for academic success
16. Students respect others who get good grades
17. Students seek extra work so that they can be successful
18. Students try hard to improve on previous work
19. Academic achievement is recognized and acknowledged at my school
20. The learning environment in my school is orderly and focused

the school. The full survey was field-tested and refined prior to administration by inviting 16 teachers, representing four geographic areas in the school district to respond to the survey and provide feedback about the clarity and intention of individual survey statements.

Student achievement data used for this study were collected by the province's Educational Quality and Accountability Office (EQAO) in 2008. The mean for student achievement in English was determined by averaging the Grade 3 and Grade 6 reading and writing scores for those schools where six or more of the teachers participated in the survey. The mean for math was determined by averaging the Grade 3 and Grade 6 math scores for those schools which were included in this study. This mean represents the average number of students who achieved a level 3 or 4 on this test in 2008; the province has set level 3 as an acceptable standard of achievement for all students.

School socio-economic status was estimated using evidence provided by Statistics Canada for each school area about average family income and percentage

of parents who had not graduated from high school The two variables were combined to create a measure of socio-economic status (SES) for each school 2006 Census date were merged with geographic data from student records. The smallest geographic area for which data were available from the Census was the dissemination area (DA), which is a neighborhood made up of 400 to 700 people. Student postal codes were linked with their corresponding dissemination areas, which allowed for assignment of Census data to individual students based on where they lived. This was the best option available, given that Statistics Canada does not release data that identifies individual households.

5.2.3 Analysis

Means and standard deviations of each item and scale were calculated. The internal reliability of each scale was tested using Cronbach's alpha. Correlations between variables were estimated and Structural Equation Modeling (SEM) was used for hypotheses testing. In this study, the relationship between different patterns of distributed leadership and each component of academic optimism was examined and then the relationship between each component of academic optimism and math and language achievement was examined. Academic optimism as a single variable was also examined in relation to different patterns of distributed leadership and both math and language achievement.

5.2.4 Results and Discussion

Table 5.2 shows the mean and standard deviation of teachers' responses to the survey using a Likert scale for four statements about leadership patterns and 20 statements about academic optimism. This table also includes mean SES data for the 113 sample schools, r the reliability of the multi-item scales used to measure academic optimism, and student achievement averages in both language and math.

Table 5.2 indicates that the scale for academic optimism and each of its components is reliable (Cronbach's alpha), exceeding .7.

5.2.5 Patterns of Distributed Leadership

Evidence in Table 5.2 indicates that teachers agreed that Planfully Aligned form of distributed leadership were evident in their schools to a greater extent (4.63) than either Anarchic Misalignment (3.82), Spontaneous Alignment (3.25), or Spontaneous Misalignment (2.73). The standard deviations for all four patterns fell in a narrow

Table 5.2 Means, standard deviations, scale reliabilities and number of items for variables in studies

	Mean	SD	Reliability	Number
Leadership patterns:			NA	
Planful alignment	4.63	.54		1
Spontaneous alignment	3.25	.53		1
Spontaneous misalignment	2.73	.65		1
Anarchic misalignment	3.82	.47		1
Academic optimism	5.27	.41	.74	20
Collective efficacy	5.42	.46	.91	5
Trust in leaders	5.44	.60	.96	5
Trust among teachers	5.31	.63	.96	4
Academic press	4.92	.48	.86	6
Student achievement in language	.73	.11	NA	NA
Student achievement in Mathematics	.73	.13	NA	NA
Collective school SES	.04	.92	NA	NA

N=113 schools [2122 teachers]

range (.41–.65) suggesting approximately similar distribution of responses by teachers to items measuring each of the four patterns.

5.2.6 Academic Optimism

The results for academic optimism as an aggregate variable, as well as the results for each component of academic optimism, suggested relatively high levels of academic optimism in these schools. As Table 5.2 indicates, the measures of component variables were found to be more reliable (.91, .96, .96, .86) then the reliability of the aggregate variable (.74). even though the number of items is much greater for the aggregate variable.

Table 5.3 reports the means and standard deviations of responses (using a seven-point scale) to the 20 items measuring academic optimism. The mean of 5.27 for academic optimism as an aggregate was relatively high and teachers did not differ widely in their perceptions (SD .41). Of the components of Academic Optimism, ratings of Collective Efficacy were 5.42 (SD .46), Trust in Leaders 5.44 (SD .60), Trust among Teachers 5.31 (SD .63) and Academic Press 4.92 (SD .48). These data suggest moderately high levels of academic optimism and its four components but with academic press rated lowest. Table 5.3 also indicates considerable consistency in teacher responses to the statements. The mean for most of the responses exceeded 5, meaning that the teachers agreed that each aspect of academic optimism was present in their school. Standard deviation fell in a relatively narrow (and low) range (.41 to .74). A reverse scale was used for three statements (12, 13 and 14) determining teachers' perceptions of collective efficacy.

Table 5.3 Mean and standard deviation for each survey question

	Mean	SD
Academic optimism	5.27	0.41
Trust in leaders	5.44	0.60
1. I feel quite confident the leaders at my school always try to treat me fairly	5.44	0.63
2. I feel a strong loyalty to our school leaders	5.29	0.67
3. I would support the leaders at my school in almost any emergency	6.06	0.51
4. It's ok in this school to discuss feelings, worries and frustrations with school leaders	5.18	0.68
5. Leaders in our school look out for the personal welfare of teachers in this school	5.22	0.74
Trust in teachers	5.31	0.63
6. Teachers in this school really care about each other	5.54	0.66
7. Teachers in this school really trust each other	5.14	0.70
8. It's OK in this school to discuss feeling, worries and frustrations with other teachers	5.24	0.65
9. Teachers in this school respect colleagues who take the lead in school improvement efforts	5.32	0.66
Collective efficacy	5.42	0.46
10. If a student doesn't learn something the first time, teachers in this school will try another way	5.86	0.45
11. Teachers in this school really believe every student can learn	5.74	0.50
12. If a student doesn't want to learn, most teachers here give up (R)	5.77	0.54
13. Teachers in my school need more training to know how to deal with the students who aren't learning (R)	3.91	0.59
14. Teachers in my school don't have the skills needed to produce meaningful student learning (R)	5.81	0.55
Academic press	4.92	0.48
15. My school sets high standards for academic success	5.63	0.60
16. Students respect others who get good grades	5.03	0.57
17. Students seek extra work so that they can be successful	3.75	0.64
18. Students try hard to improve on previous work	4.37	0.51
19. Academic achievement is recognized and acknowledged at my school	5.40	0.57
20. The learning environment in my school is orderly and focused	5.35	0.65

Table 5.3 also indicates relatively low ratings (below 4.0) for two items. The two statements were "Teachers in my school need more training to know how to deal with the students who are not learning" and "Students seek extra work so that they can be successful". Because the first statement is a reverse scored statement, the lower mean suggests that a significant number of teachers agree with this statement. This desire or willingness to engage in professional training in order to meet the needs of students who are not learning actually indicates a quality of collective efficacy in which teachers will persevere until they have found the solutions to assist each student's learning. The second statement refers to the perception teachers hold

about their students and this mean suggests many of their students do not seek extra work in order to be successful.

It is important to note that similar to the statement "Teachers in my school need more training to know how to deal with the students who are not learning", which was mentioned above, two more statements were also reverse scored statements. The two statements were "If a student doesn't want to learn, most teachers here give up" and "Teachers in my school don't have the skills needed to produce meaningful student learning". For these three statements a higher response means that teachers did not agree with the statement and obviously a lower response would mean more agreement. Though there was moderate agreement that teachers may need more training to deal with students who are not learning, there was disagreement that teachers give up on students who do not wish to learn (5.77) and teachers do not have the skills to produce meaningful student learning (5.81).

5.2.7 Socio-economic Status

SES was measured using median family income and the proportion of working age population with less than a high school education. As was previously described, this number is a school-based SES score determined from the individual score of each student in the school. Since these two variables have different units of measurement (i.e., $ for income and % for education), the standardized scores (also referred to as Z scores) were computed for each variable. For each school, Z scores were calculated for both income and education. This allowed for the combination of income and education into a single value because they were now measured using the same unit (i.e., number of standard deviations from the mean). By standardizing values in this way, the resulting distribution of values is always normal, with a mean of 0 and standard deviation of 1. For example, School A might have a Z score of 0.215 for income and −0.125 for education. This means that the median income of School A is 0.215 standard deviation units above the mean and the % of adults with less than high school is 0.125 standard deviation units below the mean.

To compute SES, the two values (income and education) for each school were averaged. Because the average of the two values was computed (as opposed to just adding them together), a mean of 0 and a standard deviation of 1 was retained for the distribution of SES scores. So, for School A, SES is computed as .045 standard deviation units above the mean of 0. Because the data from this school district were created to determine the schools with the lowest SES, a reverse code was used. In other words, positive numbers refer to schools with lower SES and negative numbers refer to schools with higher SES. The SES values in this district ranged from 2.671 (the school with the lowest SES) and −2.229 (the school with the highest SES) with a mean of 0 and a standard deviation of 1; therefore, a mean of .040 and a standard deviation of .92 would suggest that these 113 schools represent socio-economic diversity but serve a slightly lower SES demographic when compared to the rest of the district.

5.2.8 Student Achievement

To determine the mean for student achievement (Table 5.2), the 2008 EQAO Assessment for Grade 3 and Grade 6 students was used for the 113 schools where at least six teachers participated in the survey. This assessment determines student proficiency in reading, writing and math. A student is considered to be at standard when they score a level 3 or 4 (out of 4) on this assessment. The language score is the average of the reading and writing results and the numeracy score is the math result. For both scores, the average of Grade 3 and Grade 6 was determined. For example, if the score in Grade 3 reading was 68, in Grade 3 writing was 72, in Grade 6 reading was 74 and in Grade 6 writing was 71, the student achievement score in language for this school was calculated in the following way: (68+72+74+71= 285/4 = 71.25).

The mean for student achievement in language was .73 (SD .11). The mean for student achievement in math was .73 (SD .13). The mean for both math and language indicates the percentage of students who achieved level 3 and 4 on these assessments in the 113 schools. The 113 schools participating in this study would be considered similar to all of the schools in this district because the district average in math and language was also .73 in both subjects. The relatively small standard deviation in language (.11) and math (.13) indicates that most students in these 113 schools performed successfully. Compared to the Ontario provincial EQAO average in 2008 which was .65 for both language and math, these 113 schools performed above the province average in 2008.

5.3 The Relationship Between Leadership Patterns and Academic Optimism

Table 5.4 reports the correlations between the four patterns of distributed leadership and academic optimism including its component variables. These data begin to address one research question “Do some patterns of distributed leadership have greater effects on academic optimism than others?”

Planfully aligned distributed leadership is significantly and positively related to academic optimism as well as each of its components. Spontaneous alignment is negatively, (though not significantly) related to academic optimism and each of its components with one exception; the correlation between spontaneous alignment and academic press is positive yet insignificant. Spontaneous misalignment is negatively and significantly related to academic optimism and each component, while anarchic misalignment has a negative correlation to academic optimism and its components, with the exception of the correlation between anarchic misalignment and academic press where there is a positive yet insignificant correlation similar to spontaneous misalignment. The negative correlation is only significant between anarchic misalignment and academic optimism, trust in leaders and trust in teachers.

Table 5.4 Relationships between SES, Leadership patterns and academic optimism

	Academic optimism	Collective efficacy	Trust in leaders	Trust in teachers	Academic press	SES
Planful alignment	.54[a]	.40[a]	.52[a]	.32[a]	.38[a]	−.07
Spontaneous alignment	−.04	−.08	−.06	−.07	.09	−.04
Spontaneous misalignment	−.50[a]	−.31[a]	−.57[a]	−.34[a]	−.24[b]	.10
Anarchic misalignment	−.26[a]	−.18	−.30[a]	−.34[a]	.11	.00
Collective school SES	−.31[a]	−.12	−.26[a]	−.21[b]	−.32[a]	1.00[a]

Correlation Coefficients, N = 113
[a]Correlation is significant at the 0.01 level (2-tailed)
[b]Correlation is significant at the 0.05 level (2-tailed)

The correlation between SES and academic optimism and SES and each aspect of academic optimism is negative. This correlation is significant for the relationship between SES and academic optimism as a whole and between trust in leaders, trust in teachers and academic press. These results indicate less incidence of academic optimism in schools serving students with lower socio-economic status. SES has a negative correlation to each pattern of distributed leadership with the exception of spontaneous misalignment. None of these correlations are significant.

Planfully aligned distributed leadership is the only leadership pattern that has a positive and significant correlation to academic optimism and it components - collective efficacy, trust and academic press. Planfully aligned forms of distributed leadership have similar relationships with each component of academic optimism. The strength of the relationship between planfully aligned distributed leadership and each component of academic optimism is a moderate one ranging from .32 to .54.

5.3.1 The Relationship Between Academic Optimism and Student Achievement

Table 5.5 reports the correlations between SES and student achievement and academic optimism and student achievement in the 113 schools in this study. These results do not replicate previous findings (Hoy et al. 2006; McGuigan and Hoy 2006; Smith and Hoy 2007). The correlation between aggregate academic optimism and language achievement is a non-significant .13 and between aggregate academic optimism and mathematics achievement a non-significant .11. In contrast, some previous studies have reported a statistically significant relationship between academic optimism and math and language achievement of .21 and .27 respectively (Hoy et al. 2006), .54 for math and .50 for language (McGuigan and Hoy 2006) and .34 for math (Smith and Hoy 2007).

Table 5.5 Relationships between SES, Academic optimism and student achievement on 2008 EQAO tests

	Grades 3 & 6 Achievement		
	Language	Mathematics	SES
Academic optimism	.13	.11	−.31[a]
Collective efficacy	.04	.03	−.12
Trust in leaders	.06	.06	−.26[a]
Trust in teachers	−.14	−.16	−.21b
Academic press	.52[a]	.50[a]	−.32[a]
Collective school SES	−.38	−.32[a]	1.00[a]

Correlation Coefficients, N = 113
[a]Correlation is significant at the 0.01 level (2-tailed)
[b]Correlation is significant at the 0.05 level (2-tailed)

Though this study does not show a statistically significant correlation between academic optimism and student achievement in language and math, there is a statistically significant and positive correlation between academic press and language achievement of .52 and between academic press and math achievement of .50. Correlations between student math and language achievement and any other component of academic optimism are not significant.

5.3.2 Planfully Aligned Distributed Leadership and Academic Press

Path models were calculated using planfully aligned distributed leadership as the independent variable, academic press as a mediating variable, and students' math and language achievement as the dependent variable. Results of testing these two models are described in Figs. 5.1 and 5.3 which also demonstrate the effects of SES, treated as a moderator.

Figure 5.1 illustrates the effects of planfully aligned distributed leadership and academic press on language achievement. In this figure, the regression coefficient between planfully aligned distributed leadership and academic press is .36. This effect is statistically significant as is the regression coefficient between academic press and student language achievement which is .44. Collective school SES has a negative but statistically insignificant effect on planfully aligned distributed leadership (−.07) and a negative but statistically significant effect on academic press (−.30). The effect of collective school SES on student language achievement is negative and statistically significant (−.24) as would be expected from previous research (Fig. 5.2).

Figure 5.2 indicates a statistically significant and moderately strong direct effect (regression coefficient = .36) of planfully aligned distributed leadership on academic press and a slightly stronger significant direct effect (regression coefficient = .44) of academic press on students language achievement. Collective school SES

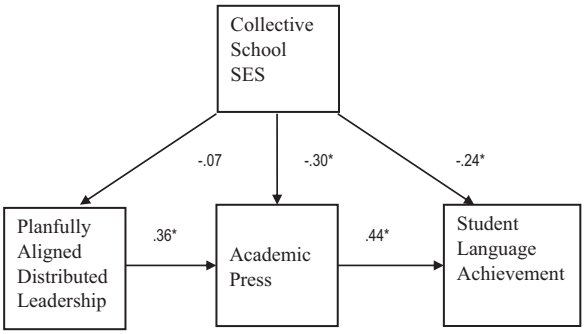


Fig. 5.2 SES, Planful alignment, and academic press effect on language achievement

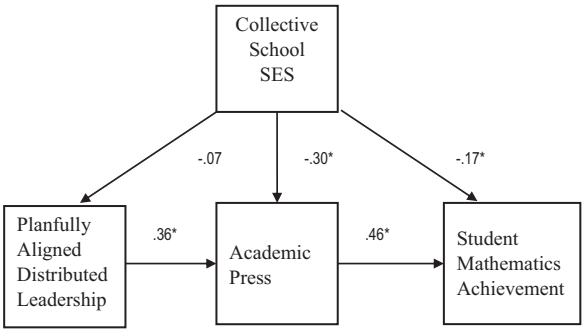
Explained Variance:	
Leadership	.00
Academic Press	.24
Student Language Achievement	.32

Fit Indices		Standardized Total Effects of:	Student Achievement
RMSEA	.00	SES	-.38*
RMR	.02	Leadership: Planful Alignment	.16*
AGFI	.96	Academic Press	.44*
NFI	.99		
X2 = .93, df= 1, p= 0.33			

has negative direct effects on all three of the other variables in this model; this effect is statistically significant in the case of both academic press (−.30) and student language achievement (− .24).

The Fig. 5.1 model, as a whole, explains 24% of the variation in academic press and 32% of the variation in student language achievement. Of the 32% of variation in student language achievement accounted for by this model (Standardized Total Effects data) academic press explains a statistically significant 44% while planfully aligned distributed leadership explains a statistically significant 16%. Most of the remaining variation is accounted for by collective school SES (−.38).

Witziers et al. reported a direct effect size of .02 when studying the direct effects of leadership on student achievement. This conclusion was drawn from the meta-analysis of 37 multinational studies (Witziers et al. 2003). According to Marzano et al. (2005) who studied the direct and indirect effect of leadership on students' achievement, the effect that was determined from this meta-analysis was .40. Since the standardized total effect of planfully aligned distributed leadership and academic press is .60, this result exceeds the effect concluded from previous studies.



Explained Variance:	
Leadership	.00
Academic Press	.24
Student Mathematics Achievement	.29

Fit Indices		Standardized Total Effects of:	Student Achievement
RMSEA	.11	SES	-.32*
RMR	.04	Leadership: Planful Alignment	.17*
AGFI	.89	Academic Press	.46*
NFI	.97		
$X2 = 2.41$, df= 1, p= 0.12			

Fig. 5.3 SES, Planful alignment, and academic press effect on mathematics achievement

Therefore, this model supports the positive effect planfully aligned distributed leadership and academic press together have on student achievement.

Figure 5.3 illustrates the effects of planfully aligned distributed leadership and academic press on math achievement. In this figure, the effect of planfully aligned distributed leadership on academic press is .36. This effect is statistically significant. The effect of academic press on student math achievement is .46; again this is a statistically significant effect. The collective school SES has a negative yet insignificant effect on planfully aligned distributed leadership (−.07) and a negative and significant effect on academic press (−.30). The effect of collective school SES on student math achievement is negative and significant (−.17). Figure 5.3 indicates a statistically significant and moderately strong direct effect (regression coefficient = .36) of planfully aligned distributed leadership on academic press and a slightly stronger significant direct effect (regression coefficient = .46) of academic press on students' mathematics achievement. Collective school SES has negative direct effects on all three of the other variables in this model; this effect is significant in the case of both academic press (−.30) and student language achievement (− .17).

The Fig. 5.3 model, as a whole, explains 24% of the variation in academic press and 29% of the variation in student mathematics achievement. Of the 29% of varia-

tion in student mathematics achievement accounted for by this model (Standardized Total Effects data) academic press explains a significant 46% while planfully aligned distributed leadership explains a significant 17%. Most of the remaining variation is accounted for by collective school SES (−.32). Since the standardized total effect of planfully aligned distributed leadership is .17, this effect is significant compared to direct leadership effects concluded from previous studies.

These findings vary from previous studies which concluded that the proportion of between-school variance in student math and language achievement explained by collective efficacy was .53 and .69 respectively (Goddard et al. 2000a, b), and the proportion of between-school variance explained by trust was .81 for both math and reading achievement (Goddard et al. 2001). Similar findings were found previously for academic press: the proportion of between- school variance in math achievement explained by academic press was .47 and in reading achievement .50. These results also challenge previous findings that academic optimism has a significant direct effect on student achievement. Academic press alone had a significant and positive impact on student achievement.

5.4 Conclusions and Implications

Three significant features of the study limit the robustness of its findings. First, evidence for the study came from only one large school district, a district with long-standing commitments to improving achievement by encouraging the development of distributed leadership in schools. This context is by no means representative of districts at large. Second, each pattern of distributed leadership was measured using only one survey item, whereas multi-item scales measuring each pattern would be likely to produce more reliable evidence about the status of each pattern in schools. Third, the evidence used to estimate student achievement was 1-year school averages; longitudinal evidence of changes in achievement would have allowed for a more direct test of the impact on improvements in achievement of the independent and mediating variables of interest in the study.

Notwithstanding these limitations, evidence from this study challenge the results of some previous research about both the contributions of academic optimism to student achievement and the widespread support for undefined concepts of “shared leadership. Among the components included in our aggregate measure of academic optimism, only academic press demonstrated significant effects on student achievement. Prior evidence does indicate that academic press, considered by itself, has a significant impact on achievement (e.g., Goddard et al. 2000a, b). Perhaps the other two components of academic optimism (trust and efficacy) contribute to student achievement only in so far as they enable the development of academic press in schools. Conceptually, academic press seems to be the closest of these three components to the expectations teachers and parents hold for student learning and that students hold for themselves. Perhaps high levels of efficacy and trust encourage both students and teachers to risk the effort and commitment required to achieve beyond

previous expectations. Using research designs that encompass all three components of academic optimism, future research testing that possibility would be useful.

There is some research on changing the attitudes and beliefs of teachers that hinder the development of high levels of academic press (Timperley and Robinson 2002), as well as the types of instructional decisions teachers make and the classroom environments they create based upon their attitudes about their students (Rubie-Davis et al. 2011). However, given the substantial contribution to student achievement of high academic press, additional research aimed at determining what school leaders might do to develop it in their schools is clearly warranted.

While all four patterns of distributed leadership included in the study are legitimate manifestations of "shared leadership", only the "planfully aligned" pattern had positive relationships with academic optimism and its components, as well as with student math and language achievement; the three other patterns actually had negative relationships with these variables. These results, should they be confirmed through subsequent research, are a call for much more discriminating approaches to sharing leadership, whether such sharing is across those in administrative roles or with teachers, parents and students. Unless such sharing is well coordinated and intentional, these results suggest, the outcome is likely to be confusion or conflict about organizational directions and strategy. Future research (using multi-scale measures of distributed leadership patterns) is needed to confirm or disconfirm findings about the need for carefully coordinated forms of shared leadership if it is make any positive contribution to student achievement and the conditions in schools which mediate such achievement. Qualitative studies unpacking in much more detail the nature of such coordinated patters would also be very useful.

Further study is also needed about how planfully aligned distributed leadership is implemented in schools and what those in formal leadership positions must do to support this type of leadership.

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