The Contribution of Prior Student Achievement and School Processes To Collective Teacher Efficacy in Elementary Schools[1]

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Abstract

Collective teacher efficacy refers to teacher perceptions that they constitute an effective instructional team, capable of bringing about learning in students. Previous research demonstrates that a school staff with a strong sense of collective efficacy is likely to generate high student achievement. This study of 2170 teachers in 141 elementary schools used structural equation modeling to examine the antecedents of collective teacher efficacy. The study found that prior student achievement in grade 6 mathematics predicted collective teacher efficacy, as predicted by social cognition theory. The study also found that school processes that promoted teacher ownership in school directions (shared school goals, school-wide decision making, fit of plans with school needs, and empowering principal leadership) exerted an even stronger influence on collective teacher efficacy than prior student achievement. School cohesions and support contributed to collective teacher efficacy but only in domains in which the school had control over its directions.

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Collective teacher efficacy is "the perceptions of teachers in a school that the efforts of the faculty as a whole will have a positive effect on students" (Goddard, Hoy, & Hoy, 2000, p. 480). The construct has been proposed, on theoretical and empirical grounds, as an addition to individual teacher efficacy in studies of the effects of teacher cognition on school outcomes. In contrast with the large number of studies on the antecedents of individual teacher efficacy, there have been few attempts to understand factors that contribute to the emergence of collective teacher efficacy. This study examined the effect of two sets of variables that have theoretical appeal as possible predictors: prior student achievement and school processes, particularly patterns of staff interaction.

Literature Review

Self-efficacy, Teacher Efficacy and Collective Teacher Efficacy

In social cognitive theory, *self-efficacy* is "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 2). Self-efficacy influences behavior through cognitive processes (especially goal setting), motivational processes (especially attributions for success and failure), affective processes (especially control of negative feelings), and selection processes (Bandura, 1993). Individuals who feel that they will be successful on a given task are more likely to be so because they adopt challenging goals, try harder to achieve them, persist despite setbacks, and develop coping mechanisms for managing their emotional states.

Teacher efficacy is a teacher's expectation that he or she will be able to bring about student learning. It is a set of self-efficacy beliefs that refer to the specific domain of the teacher's professional behavior. Teacher efficacy may be correlated with other dimensions of self-efficacy. For example, Authors (2001) found that teachers' expectations about their ability to

teach with computers (i.e., teacher efficacy) was positively correlated (r=.57) with expectations about their ability to use computers to accomplish personal goals (i.e., self-efficacy for personal computer use). Despite such inter-correlations among self-efficacy domains, self-efficacy is not a generalized expectancy. Self-efficacy is situationally specific. It develops from a subject's appraisal of past experience with particular tasks or with activities similar to it, although perceptions of efficacy can be modified by other sources of information such as observing the performances of others (Bandura, 1997).

Teacher efficacy is of interest to school improvement researchers because teacher efficacy consistently predicts willingness to try out new teaching ideas, particularly techniques that are difficult to implement and involve risks such as sharing control with students (Czerniak & Schriver-Waldon, 1991; Dutton, 1990; Hani, Czerniak, & Lumpe, 1996; Riggs & Enochs, 1990; Ross, 1992). High expectations of success motivate classroom experimentation because teachers anticipate they will able to achieve the benefits of innovation and overcome obstacles that might arise. School improvement researchers have also focused on teacher efficacy because teachers with high expectations about their ability to teach produce higher student achievement in core academic subjects (Anderson, Green, & Lowen, 1988; Ashton & Webb, 1986; Authors, 1992; 1993; Cancro, 1992; Moore & Esselman, 1994; Watson, 1991) and on affective goals like self-esteem (Borton, 1991), self-direction (Rose & Medway, 1981), motivation (Roeser, Arbreton, & Anderman, 1993) and attitudes to school (Miskel, McDonald, & Bloom, 1983). Teacher efficacy contributes to achievement because high efficacy teachers try harder, use management strategies that stimulate student autonomy, attend more closely to low ability student needs, and modify students' ability perceptions (evidence reviewed in Authors, 1998-a).

Collective teacher efficacy differs from teacher efficacy in that collective teacher efficacy refers to expectations of the effectiveness of the staff to which one belongs, whereas teacher

efficacy refers to expectations about one's own teaching ability. Although collective and individual teacher efficacy are correlated (Goddard & Goddard, 2001), they are conceptually distinct. For example, it is not hard to imagine a teacher who believed she would be more or less successful than her staff as a whole.

Collective teacher efficacy has attracted researcher interest for theoretical and empirical reasons. Bandura (1997) argued that self-efficacy is not an omnibus trait but a differentiated set of self-beliefs linked to distinct realms of human functioning. For this reason he rejected most teacher efficacy scales because they "are, in the most part, still cast in a general form rather than being tailored to domains of instructional functioning" (1997, p. 243). Bandura also recommended that self-efficacy instruments be written at the same level of generality as the outcomes they potentially predict: For group outcomes, measures that probe the characteristics of the group are required, not estimates of individual functioning aggregated to the collective.

Goddard and others created a collective teacher efficacy measure that addressed Bandura' critique. Their instrument is based on two dimensions of collective teacher efficacy (analysis of the teaching task and perceptions of teaching competence) derived from an extensive review of the teacher efficacy research (Tschannen-Moran, Hoy & Hoy, 1998). The instrument asks teachers to report their perceptions of the ability of their staff. Collective teacher efficacy is a powerful predictor of student achievement. Bandura (1993) found that collective teacher efficacy was a stronger predictor of achievement than student socio-economic status or stability of the study body. Goddard (2001) found that collective teacher efficacy explained 47-50% of the between-school variance in mathematics and reading achievement. Goddard et al. (2000) and Goddard and Goddard (2001) obtained similar results. They argued that collective teacher efficacy influences student achievement by creating school norms and sanctions that motivate

persistence. The same argument was used by Tschannen-Moran and Goddard (2001) to explain the effect of collective teacher efficacy on faculty trust.

Sources of Efficacy Information

In this section we identify, from social cognition theory, potential contributors to collective teacher efficacy. We focus on contributors related to prior achievement and to professional interactions within a school staff.

Bandura (1986) argued that the sources of individual and collective self-efficacy information are similar. Bandura proposed (and evidence collected by Lent, Lopez, & Bieschke, 1991 and Lopez & Lent, 1992 demonstrated) that the most powerful source of efficacy information is mastery experiences. Teachers who perceive themselves to have been successful on a particular task, either individually or as part of a collective, believe they have the ability to perform that task and anticipate that they will be successful in future encounters with it. Such expectations encourage teachers to set higher goals and to persist until they have been attained.

The best proxy for mastery experiences at the school level might be prior achievement scores of the school. Such scores are likely to be the strongest predictor of collective teacher efficacy in jurisdictions where school achievement is defined by a mandated assessment in which an external test based on a common standard is used to compare schools. The only two studies to investigate the link between collective teacher efficacy and prior achievement confirmed the relationship. Bandura (1993) found that achievement in reading and mathematics measured at the beginning of the year predicted collective teacher efficacy measured at the end of the year. Goddard (2001) found that 65% of the between-school variance in collective teacher efficacy could be attributed to a reading test administered one year earlier.

Social interactions among teachers and with administrators influence whether teachers interpret prior school achievement as evidence of mastery. Collaboration among teachers

promotes individual teacher efficacy (Authors, 1992; Chester & Beaudin, 1996; Louis, 1991; Morrison, Walker, Wakefield, & Solberg, 1994; Rosenholtz, 1989). In a longitudinal study of fluctuations in teacher efficacy during a period of high stress, Authors (1997) found that collaboration contributed to teachers' knowledge of their classroom effectiveness through the collective identification of indicators of students' cognitive and affective performance. This process made it easier for teachers to recognize when they were successful. Mastery is both an individual and a social construction in which achievements by students are interpreted as evidence of teacher success and failure, thereby contributing to individual and collective teacher efficacy. The influence of the collective on the individual is likely to be higher in schools in which teachers share a common vision about school directions. Collective teacher efficacy is more likely to increase if the shared vision is of a school committed to student and teacher learning, key elements of a school that is a professional community (Louis & Marks, 1998).

Although mastery is likely to be the most influential source of efficacy information, Bandura (1986) identified other sources: vicarious experience, social persuasion, and affective states. Goddard et al. (2000) drew an analogy between individual and organizational learning to interpret these categories as contributors to collective teacher efficacy. They interpreted vicarious experience at the collective level to mean that the organization learns from other organizations; i.e., if an organization with similar characteristics in a similar environment overcomes obstacles to become successful, the collective teacher efficacy of the observing organization should rise. But opportunities for teachers to observe other schools are rare—even observing other classrooms is infrequent. A more likely mechanism is that heightened interaction among teachers provides opportunities to observe the contribution of the collective to individual success. For example, teacher collaboration might create a climate that legitimates help seeking, joint problem solving, and instructional experimentation. By interacting with their colleagues teachers might

acquire teaching strategies that enhance their effectiveness, thereby increasing perceptions of their individual and collective success and expectations for the future.

Social persuasion, the third source of efficacy information, consists of organizational members persuading other members that they constitute an effective team. As Goddard et al. (2000) argue, the more cohesive the faculty, the more likely teachers can be persuaded. For example, a cohesive faculty is likely to have knowledge of the skills and concerns of individual teachers that can be used to construct persuasive arguments about the fit of individuals into team. In addition, greater cohesion creates more opportunities for teachers to see examples of successful collaborations; for example, a jointly developed unit that increased performance in mathematics in one grade might persuade teachers in another of the efficacy of their staff.

The fourth source is affective states. Emotional turmoil signifies to its members that an organization lacks the ability to fulfill its mandate. Social processes that generate peer support are likely to reduce the effects of negative emotions on collective teacher efficacy beliefs. Although no study investigated this link at the collective level, there is evidence that teacher stress has negative effects on individual teacher efficacy (Bliss & Finneran, 1991; Brissie, Hoover-Dempsey, & Bassler, 1988; Greenwood, Olejnik, & Parkay, 1990).

School processes that contribute to a cohesive, supportive climate are likely to contribute to each of the four sources of efficacy information, especially the most powerful, mastery experiences. The leadership style of the school might also contribute to the same sources. For example, principals could influence teacher interpretations of school achievement by defining what constitutes success. Since principals typically have experienced a wider variety of school settings than their teachers and have legitimate authority, principals are well-placed to set feasible goals and interpret achievement data as evidence of success and failure to meet these goals. Principals can also identify exemplars of successful team performance and make it easier,

for example through timetabling, for teachers to observe each other, thereby providing opportunities to strengthen collective teacher efficacy through vicarious experience. Principals can persuade teachers that they can become an effective organization, for example, through personnel supervision and staff development processes. Equally important is the potential role of the principal in reducing teacher stress, for example, by protecting staff from district initiatives and excessive community expectations. Although no study has investigated the role of the principal in contributing to collective teacher efficacy, there is evidence that a supportive principal, particularly one enacting a transformational approach to school leadership, can contribute to individual teacher efficacy (Brissie et al., 1988; Hipp & Bredeson, 1995; Lasserre, 1989; Lubbers, 1990; Riehl & Sipple, 1995).

Although no previous study has investigated the effect of school processes on collective teacher efficacy, Goddard (2002) found that collective teacher efficacy accounted for 24% of the variance in teacher influence on decision making. An increase of one standard deviation in collective teacher efficacy was associated with .41 SD increase in teacher influence. Goddard argued that teachers must have opportunities to exercise decisions in order for a sense of collective agency to develop.

In summary, Bandura's four sources of efficacy information can be provided through several school conditions. Among the most powerful are likely to be prior student achievement, collaborative school processes, including leadership behavior, that contribute to cohesion and support for teachers. Although previous research has found that collective teacher efficacy is influenced by prior achievement (Bandura, 1993; Goddard 2001) and is associated with some school processes (Goddard, 2002), the independent effects of prior achievement and school processes variables have not been examined in the same study.

Research Question

The study was guided by the question, to what extent do student achievement and school processes contribute to collective teacher efficacy? We anticipated that collective teacher efficacy would be higher in schools with higher prior student achievement and in schools with greater cohesion and support for teachers. We examined two dimensions of school processes. In the first model we looked at a cluster of variables that we represented as school cohesion and support. In the second model we limited the model to school processes that gave teachers shared ownership of school decisions.

Method

Sample

Teachers in all elementary schools in a large school district in Ontario (Canada) with at least 10 grade 6 students (*N*=160 schools) were invited to participate in the project. The district served middle class students (average family income=US$ 33,286 SD= US$9,783). Only 3% of the students regularly spoke a language other than English in the home; 2% were enrolled in an English as a Second Language program; 17% were receiving some form of special education. We deleted 19 schools for which fewer than five teacher responded. The criterion of five responses was based on the demonstration (cited by Kreft & De Leeuw, 1998) that if there are 150 schools in a sample, five observations per school are sufficient to bring the power of the study to .90 (i.e., there is a 90% chance that an effect of medium size can be detected). Ten schools were missing data for either family income or achievement. We replaced missing values with the district means. The final sample consisted of 141 schools, representing 88% of the population of schools, and 2170 teachers, representing 65% of district teachers.

Instruments

The primary data source was a survey distributed to schools in February, 2001. All items were in Likert format with a 6-point response scale anchored by strongly disagree and strongly agree. The outcome variable, *collective teacher efficacy*, consisted of 14 items reflecting two dimensions of collective teacher efficacy: the 7 items with the highest loading on the perceptions of the task factor and the 7 with the highest loading on the perceptions of teaching competence factor, reported by Goddard et al. (2000). We developed a shorter instrument because the original 21-item instrument was unbalanced in its weighting of the two dimensions of teacher efficacy identified by Tshannen-Moran et al. (2001), as noted by Goddard (2002). Although the two-factor structure of the variable was maintained for face validity reasons, the two factors are highly correlated and, as in previous research, we combined the items into single scale.

There were two categories of predictor variables. The first set consisted of 5 school process variables, measured with Likert items with a 6-point response scale. We hypothesized that a latent variable, labeled *school cohesion and support*, derived from these variables would predict collective teacher efficacy. The variables were defined as: *Shared school goals*: teachers' perceptions that the school has reached consensus about overall directions and the use of school priorities by teachers when making professional decisions. The school goals are oriented to the promotion of student and teacher learning. *School-wide collaboration*: teachers' feelings that they are well prepared to participate in key school issues and have opportunities to deliberate with colleagues. *Fit of Actions with School Needs:* teachers' belief that the actions taken by their school fit the current needs of students and staff. *Teacher learning opportunities:* perceived support for teachers' professional learning. *Empowering School leadership:* teacher perceptions that the principal embodies the ideals of transformational leadership, i.e., the principal leads by developing the capacity of the organization and its members to adapt to the demands of a

changing environment (Leithwood, Jantzi, & Steinbach, 1999). Each scale consisted of 7 items, 12 in the case of school leadership, derived from previous research (primarily Leithwood & Aitken, 1995; Rosenholtz, 1989; and Authors, 1998-b). In all scales we attempted to balance between positively and negatively worded items. Scoring on the latter was reversed prior to analysis. The items used to construct the variables in the study are displayed in the Appendix.

The two criteria for scale acceptability, set in advance of the study, were: internal consistency of at least alpha=.70 and no item-total correlations below .20. All scales met both criteria. The number of items in each variable and the alpha reliabilities in this study are displayed in Table 1. All survey data were aggregated to the school level.

Table 1

Reliability, Means, and Standard Deviations of Study Variables (*N=141 schools)*

Variable	# of Items	Alpha	Mean	SD
Shared school goals	7	.80	4.92	.39
School-wide collaboration	7	.80	4.20	.55
Fit of school plans with school needs	7	.83	4.71	.41
Teacher learning opportunities	7	.79	4.34	.39
Empowering school leadership	12	.91	4.82	.51
Collective teacher efficacy	14	.83	4.61	.44
Achievement overall	9	.96	2.55	.40
Achievement residual	-	-	.0024	.36
Average family income (CAN$)	-	-	52,835	15,530

The second category of predictor, *prior school achievement*, consisted of grade 6 mathematics scores from a mandated assessment, administered to all students in the province the previous year (May, 2000). The test was a performance assessment conducted over 5 days (90

minutes per day) in which students responded to open ended problems that provided for multiple solution strategies. The provincial testing organization (EQAO: Educational Quality and Accountability Office) reported for each school the percentages of students placed in each of five achievement categories (less than level 1, coded in this study as level 0, to level 4). School means were provided separately for five strands (types) of mathematics and four problem solving dimensions. We represented mathematics achievement as the mean of these nine subscores.

A variety of strategies for adjusting raw achievement scores have been proposed, each having a different impact on results (Reynolds, 2000; Thomas, & Mortimore, 1996). One measure that is a strong predictor of achievement in Canada is family income. Willms (2002) found that family income had a large effect on 4-5 year old students' receptive vocabulary. Nagy, Traub, and Moore (1999) found that family income accounted for 6-12% of the variance in grade 6 mathematics achievement in Ontario. The influence of student demographics (a composite of four factors headed by family income) was even stronger in Alberta, accounting for 45% of the variance in school scores on the grade 6 mathematics mandated assessment (Lytton & Pyryt, 1998). For this study we used mean family income of the enumeration area represented by the postal code of the school (obtained from the 1996 census) as a proxy for the mean family income of students attending that school. Nagy et al. (1999) compared methods of using census data to measure neighbourhood characteristics in a sample of Ontario schools. The methods produced correlations between family income and achievement scores that differed in size (by 23-30%) but not in direction. In our view, the differences in outcome were not large enough to warrant the dramatically higher cost of tracking individual student postal codes. In this study family income correlated with achievement (r=.41). We regressed grade 6 achievement from 2000 over school family income. The residual constituted *prior school achievement*.

Analysis Procedures

We tested two models using structural equation modelling. The raw data were input to SPSS and the variance-covariance matrix was analysed using the maximum likelihood method of AMOS 4.0 (Arbuckle & Wothke, 1999). In Model A, displayed in Figure 1, we tested five school process variables as measures of the latent variable *school cohesion and support* and examined the fit indices of this latent variable and prior school achievement as predictors of collective teacher efficacy. The rationale behind Model A was that schools with a tightly knit social network committee to student and staff improvement would be more likely to generate positive information about the collective teacher efficacy of the faculty. In model B, displayed in Figure 2, we tested four school process variables (i.e., the five in Model A less Teacher Learning Opportunities) as measures of the latent variable *teacher ownership* and examined the fit of this latent variable with prior school achievement as predictors of collective teacher efficacy. The rationale for Model B was that professional development opportunities in the site in which we conducted the research were influenced by changes in the educational funding formula two years earlier. Essentially, school district budgets were largely set by the province rather than by district trustees who operated within highly prescribed envelopes and regulations. This resulted in fewer in-service opportunities and provincial control of most of those that remained. This meant that control of the most important PD opportunities was transferred out of the school, beyond the control of either teachers or principals. We anticipated that this transfer communicated a lack of confidence by the province in the school's ability to manage the development of its staff. From the perspective of social cognition theory, the change would be expected to depress collective teacher efficacy. To emphasize the difference between Models A and B we labeled the latent variable in Model B as *Teacher ownership of school processes*.

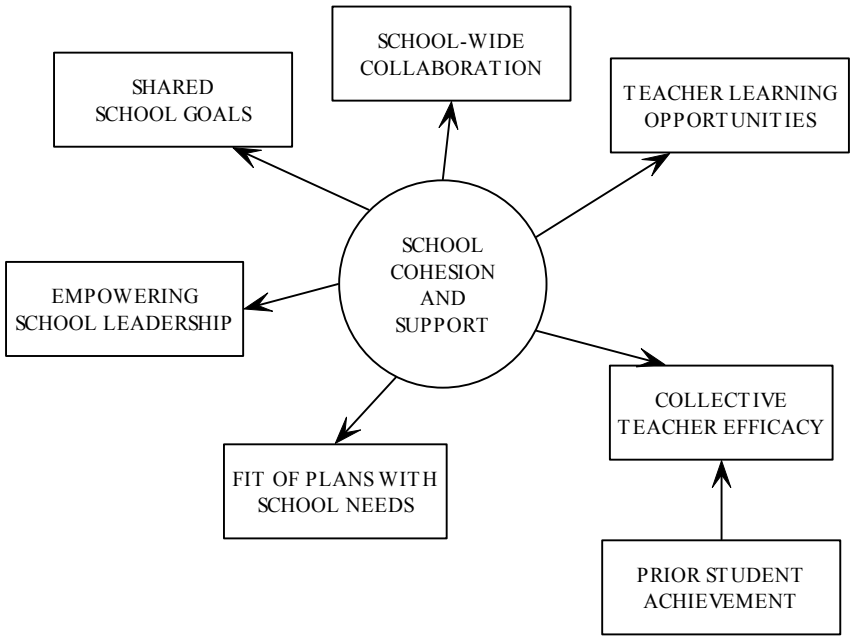

Figure 1. Model A: Hypothesized contributions of school cohesion and prior achievement to collective teacher efficacy.

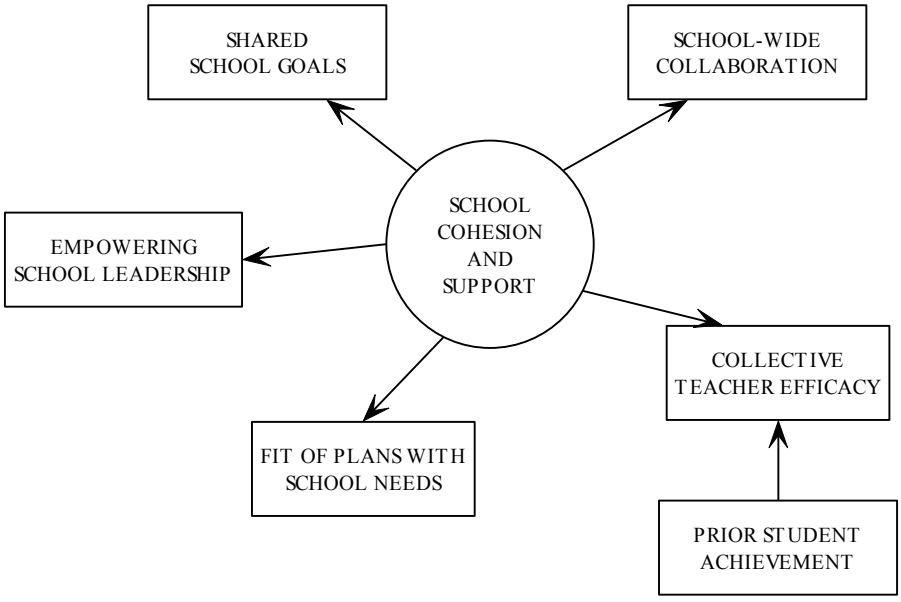

Figure 2. Model B: Hypothesized contributions of teacher ownership and prior achievement to collective teacher efficacy.

We began by testing the fit of collective teacher efficacy with school achievement and one school process variable. After each school process variable had been tested separately, we tested Model A: the fit when five school process variables were included as estimates of the latent variable *school cohesion and support*. We then tested Model B: the fit when four school process variables were included as estimates of the latent variable *teachers ownership of school processes*. Our criteria for goodness of fit were chi square >.05, GFI (Goodness of Fit) >.95, AGFI (Adjusted Goodness of Fit) >.90, RMR (Root Mean Square Residual) <.05, and RMSEA (Root Mean Square of Approximation) <.08 (Browne & Cudeck, 1993). We focused especially on the AGFI because it adjusts for sample size and the RMSEA because it adjusts for number of variables in the model (following guidelines of Thompson & Daniel, 1999).

Results

Table 1 displays the means and standard deviations for the variables in the study. Table 2 displays the correlation matrix. Table 2 shows that each of the five school process variables and prior achievement were significantly correlated with collective teacher efficacy. The table also shows that all school process variables were significantly correlated with each other but not necessarily with prior school achievement.

Table 2. *Inter-correlation of School Process Variables, Prior School Achievement, and Collective Teacher Efficacy (N=141 schools)*

	CTE	S_goals	Collab	Fit	Lrn_ops	Leadshp
CTE	-					
S_goals	.49***	-				
Collab	.38***	.76***	-			
Fit	.50***	.88***	.85***	-		
Lrn_ops	.41***	.73***	.81***	.75***	-	
Leadshp	.44***	.81***	.81***	.85***	.72***	-
Achiev	.44***	.15	.07	.18*	.08	.07

***p<.001.

In the first step we tested each school process variable separately in models that included only prior achievement and collective teacher efficacy. Table 3 displays the fit indices. All five of the single school process variable models provided a reasonably good fit of the data.

Table 3. *Fit Indices for Models Containing Collective Teacher Efficacy, Prior Achievement, and One School Process Variable* (*N=141 schools)*

	GFI	AGFI	RMR	RMSEA
Shared school goals	0.990	0.942	0.007	0.088
School-wide collaboration	0.998	0.989	0.013	0.000
Teacher learning Opportunities	0.999	0.995	0.002	0.000
Empowering school leadership	0.997	0.983	0.005	0.000
Fit of plans with school needs	0.987	0.925	0.008	0.110

Figure 3 shows the result of combining five school process variables into a latent variable labelled *school cohesion and support* and then tracing the hypothesized paths from the latent variable to collective teacher efficacy. The numbers near the single-headed arrows are standardized regression weights; all were statistically significant at $p<.05$. Model A in the figure shows that when the five process variables are in the model, school processes and prior achievement each predict collective teacher efficacy. The latent variable *school cohesion and* support was a stronger predictor of collective teacher efficacy than prior achievement. The fit of the data was reasonably good, but Model A passed only two (GFI and RMR) of the five tests. It failed the two most important tests that adjust for sample size (AGFI) and number of variables in the model (RMSEA).

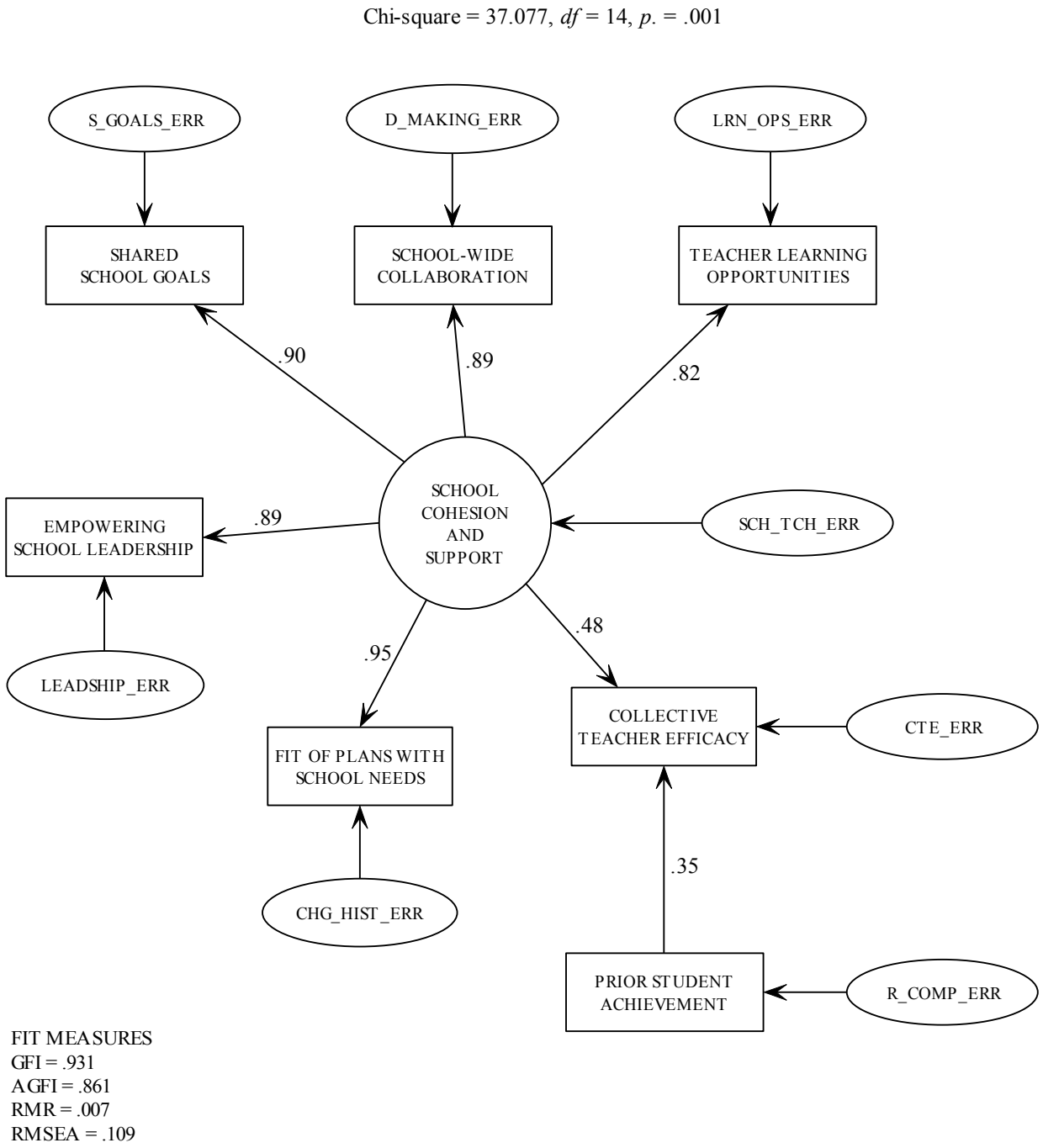

Figure 3. Model A standardized estimates..

Figure 4 displays the test of Model B. The standardized regression weights of the four school process variables on the latent variable were virtually identical to those in Model A, albeit very slightly larger. The latent variable, *teacher ownership of school processes* was a significant

predictor of collective teacher efficacy. *Prior student achievement* was also a significant but slightly weaker predictor of collective teacher efficacy. Model B model met all five goodness of fit criteria.

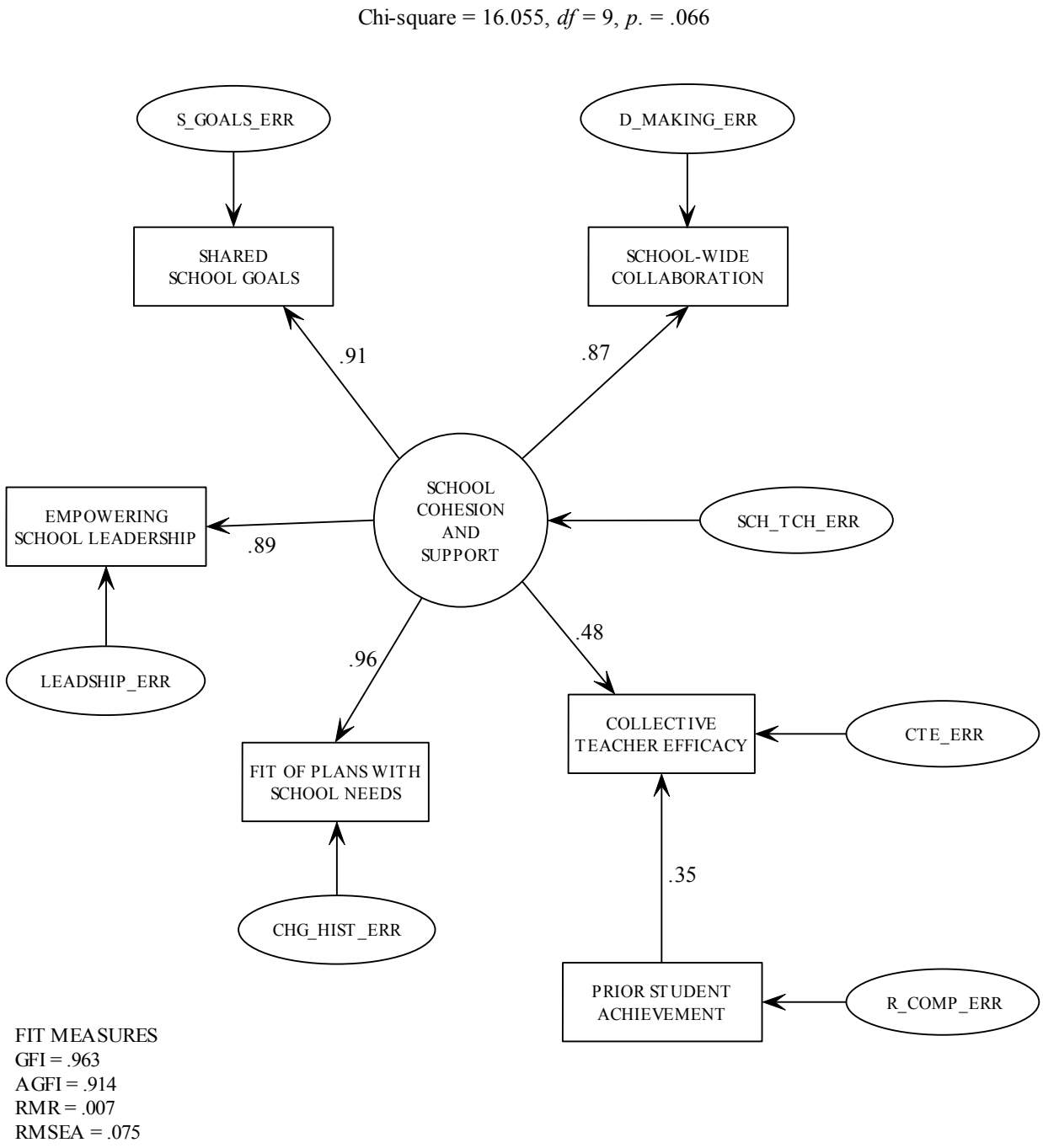

Figure 4. Model B standardized estimates.

To summarize, in Models A and B *prior achievement* and a latent variable representing school processes each contributed to collective teacher efficacy. In both models the effects of school processes were greater than prior achievement. Comparison of the models indicated that the school processes that had the strongest effect on collective teacher efficacy were shared *school goals, school-wide collaboration, fit of plans with school needs,* and *empowering school leadership*. The results indicated that school processes that contribute to collective teacher efficacy were better represented by the construct of teacher ownership of school processes (Model B) than by the very similar construct of school cohesion and support.

Discussion

The first result of this study is that prior student achievement predicted collective teacher efficacy. This confirms the only other studies (Bandura, 1993; Goddard, 2001) to examine the relationship. When combined with the previously established finding that collective teacher efficacy contributes to current or future achievement (Goddard, 2001; Goddard & Goddard, 2001; Goddard et al., 2000), the results suggest that there is reciprocal relationship between a school's collective teacher efficacy and the achievement of its students. Confidence in the finding is further increased by the fact that the pattern found at the collective levels mirrors the reciprocal nature of the relationship between individual teacher efficacy and student achievement (evidence reviewed in Authors, 1998-a).

The finding confirmed our hypothesis that scores from a mandated assessment would influence teacher perceptions of their effectiveness as a staff. However, Bandura argued that mastery experiences would be the strongest influence on collective teacher efficacy and Goddard (2001) found that two-thirds of the variance in collective teacher efficacy could be explained by prior achievement. In our study school processes were a larger contributor. Our explanation is that our teachers were sceptical about the validity of the mandated assessment scores included in

our models. First, they believed the standard was set too high. The Ministry of Education and Training defined adequate performance as level 3 (on a 0-4 scale), which corresponded to a B on the student report card that the province required all schools to use. Teachers thought the acceptable level should be level 2 (corresponding to C) or level 1 (corresponding to a pass). The difference in standards was enormous: over 90% of students met the level 1 standard while only half met the level 3 standard. Teachers also thought that the mathematics curriculum (revised in 1998) measured by the test was too difficult for most students. Second, schools were given only raw achievement scores. Teachers believed that the EQAO results were affected by student demographics, especially socio-economic status, and that the failure to consider socio-economic status created an unfair picture of school performance.

Prior school achievement is likely to be a stronger predictor of collective teacher efficacy in jurisdictions in which assessment scores with greater credibility to teachers are available. However, few jurisdictions provide "value-added" as well as raw scores. Heck (2000) found only four American states (Kansas, Kentucky, North Carolina, Tennessee) that did so and no Canadian province is moving in that direction. Studies of the consequential validity of mandated assessments in a broad range of sites and test types provide recurring reports of teacher concerns that the tests are too difficult for the students they teach (e.g., Madaus & Kellaghan, 1993; Mehrens, 1998; Smith, 1991).

Another factor that may have affected the influence of prior student achievement on collective teacher efficacy was our use of grade 6 mathematics scores as a proxy for school achievement. Other researchers have found there is only a moderate correlation (r=-.40-.50) in school student achievement between subjects and even less consistency between grades (Linn & Haug, 2002; Teddlie, Reynolds, & Sammons, 2000). For teachers in lower grades and those who

made language rather than math their classroom priority, grade 6 mathematics scores may have made only a small contribution to their estimate of prior school achievement.

The second result of the study is that school processes influenced collective teacher efficacy. These school processes contributed collective teacher efficacy information by influencing teacher cognitions about mastery experiences, by providing opportunities for vicarious experience, through persuasion, and by protecting teachers from the dysfunctional effects of negative emotional states.

The third result of the study was that the school process variables that figured in the best model, shown in Figure 4, each emphasized teacher ownership of the successes and failures of the school. The earliest theorizing about teacher efficacy followed Rotter's (1966) personality theory; i.e., that we develop generalized expectancies from the belief that outcomes are the result of our own actions or by forces beyond our control. Locus of control was the guiding theory generating the first teacher efficacy scales: the Rand items (Armor et al., 1976), willingness to take responsibility for student success and failure (Guskey, 1982), and locus of control (Rose & Medway, 1981). The locus of control strand diminished within teacher efficacy research as social cognition theory seemed to provide researchers with a more complete explanation of motivation. Bandura (1997) provided evidence that locus of control (which he folded into the construct of outcome expectancy) was independent of self-efficacy and the two scales of Gibson and Dembo's (1984) instrument are usually only weakly correlated.

The Tschannen-Moran et al. (1998) interpretation of teacher efficacy research argued there were two factors operating in the teacher efficacy construct: an assessment of personal competence to perform a task and an analysis of that task in terms of resources and constraints in particular teaching contexts. The analysis of the task dimension re-introduced the locus of control theme. Recent measures of individual (Tschannen-Moran & Hoy, 2001) and collective

teacher efficacy (Goddard et al., 2000) give equal emphasis to both dimensions. However, examination of the items in the collective teacher efficacy scale indicates that analysis of the task is limited to student home and community issues. The items do not address the range of other resources and constraints that influence a staff's perception of its ability to bring about student learning. For example, Ontario teachers believed there had been a reduction in professional development opportunities, planning time, and a shortage of classroom supplies including textbooks—all factors that limited resources available to them. In addition, Ontario teachers perceived the curriculum to be too difficult, too extensive, and too inflexible to meet the needs of many of their students. The identification in our study of teacher ownership as a unifying theme in the school processes that predict collective teacher efficacy highlights the importance of conceiving of resources and constraints more broadly than is the case in the current version of the instrument.

The centrality of teacher ownership in our study reinforces Goddard's (2002) finding that collective teacher efficacy contributes to teacher influence over decisions about curriculum, instructional materials and activities, professional development, communication with parents, and disciplinary policy. Our study complements his in completing the circle. Together they demonstrate there is a reciprocal relationship between teacher ownership of school processes and collective teacher efficacy. Goddard argued that for groups to make a difference, they must have the means to do so. Our study provides support for this claim: staff cohesion provided opportunities for teachers to generate a sense of collective purpose but they developed feelings of agency only in areas in which the school had the discretion to act.

Limitations of the Study

The study was limited in two ways. First, we operationalized prior achievement in terms of mandated assessment scores from a single grade and subject, a limitation shared by other

research in the domain. We suspect that a similar study using reading scores, especially for a lower grade, would have shown weaker relationships between prior student achievement and collective teacher efficacy. Mathematics scores are less influenced by student demographics than language scores and the between-school variance is usually higher in math than language (e.g., Heck, 2000).

Second, although the study used adjusted raw scores to estimate prior achievement, the teachers did not have this information. They likely adjusted raw scores in terms of their perception of the teachability of the students in the school but we have no way of estimating how similar their adjustments were to ours.

Implications for Researchers

This study expands our understanding of the genesis of collective teacher efficacy, identifying two clusters of variables that contribute to it. At a practical level, it suggests specific areas of teachers' professional lives that school improvement efforts might target, given the strong and reciprocal relationship of collective teacher efficacy with student achievement. The findings are likely to be of particular interest for school improvement researchers. Collective teacher efficacy could serve as a powerful a mediating variable in school improvement research, providing an explanation of why some schools are "moving" or "stuck" (Hopkins, Ainscow, & West, 1994), why site-based decision making has positive outcomes in some schools and not in others (Wolf, Borko, Elliott, & McIver, 2000), and in identifying the conditions that lead to productive professional communities in schools (Louis & Marks, 1998).

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CTE=Collective Teacher Efficacy, S_goals=Shared school goals, Collab=School-wide collaboration, Fit=Fit of school plans with school needs, Lrn_ops=Teacher learning opportunities, Leadshp=Empowering school leadership, Achiev=Prior student achievement (Gr. 6 Mathematics).

Appendix