An Examination of the Multilevel Relationship between Teacher Efficacy, Teacher Collaboration and Academic Press in Urban Elementary Schools

Dissertation

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Ajatshatru Mehta

Graduate Program in Education: Educational Studies

The Ohio State University

2019

Dissertation Committee

Professor Roger D. Goddard, Co-advisor

Associate Professor Anika B. Anthony, Co-advisor

Assistant Professor Karen S. Beard

Abstract

This quantitative study was conducted to test three hypotheses: (1) teacher efficacy varies significantly within and between urban schools; (2) after controlling for teacher-level demographic variables, teacher collaboration is a positive and significant predictor of variation in teacher efficacy; (3) after controlling for school-level contextual variables, school academic press is a positive and significant predictor of variation in teacher efficacy. Data were collected from 383 elementary school teachers from 44 schools in a Midwestern urban school district. The study included charter and traditional public schools within the same school district.

A teacher's sense of high efficacy is related to student-level outcomes such as higher achievement and better behavior (Tschannen-Moran, Hoy, & Hoy, 1998). Moreover, efficacious teachers tend to report feelings of less stress and are more likely to stay in the profession (Nathaniel, Sandilos, Pendergast, & Mankin, 2016). Thus, teacher efficacy is of significance for urban schools that have been hindered by low achievement scores and high rates of teacher attrition. The current study employed social cognitive theory and proposed that teacher efficacy may have an association with school academic press and teacher collaboration as both academic press and teacher collaboration operate through the sources of efficacy viz. social persuasion, mastery, and vicarious learning.

Teacher collaboration, focused on instruction and mandated by the state, is a recent addition to a teacher's job description. Therefore, little is known about the association between formal teacher collaboration that is focused on instruction and teacher efficacy beliefs. A school's academic press represents an environment that is focused on teaching and learning (Goddard, Sweetland, & Hoy, 2000). Schools with high academic press have policies, procedures, expectations, and rewards geared towards academics and achievement. Though researchers have studied the relationship between teacher efficacy and school academic press in the early 1990s, there remained a chasm in literature (Chong, Klassen, Huan, Wong, & Kates, 2010) as the statistical methods used in the 1990s can best be described as rudimentary compared to advanced methods like multilevel modeling employed in this study.

Using multilevel models, the study provided support for the hypothesis and reported that variation in teacher collaboration and school academic press explained more than half of the observed variation in teacher efficacy. The study offers school leaders a pathway to impact teacher efficacy. A school environment that is focused on academics and fosters collaboration by providing teachers with time and resources to collaborate effectively also tends to inculcate higher efficacy beliefs in its teachers.

Dedication

To

My Mother

and countless other efficacious teachers

Acknowledgments

A study on teachers will be incomplete without thanking my first teacher, my mother. You worked so hard and sacrificed so much for us. Despite all the hardships, you never ceased to encourage me to do my best and taught me to be happy in what-ever endeavor I undertake. All my accomplishments would have been impossible without your prayers and blessings. I pray that I get you as a mother in every reincarnation. Also big thanks to the triumvirate of my elder sisters for your unwavering confidence in my abilities, I would not have reached so far without your good wishes.

I am lucky to have studied under the tutelage of the best teachers in Educational Administration. It is rare to find a department filled with faculty that is knowledgeable, encouraging, and inspiring. The Department of Educational Administration has high academic emphasis or press as evident by the rigorous lessons conducted by the faculty. This faculty planted the seeds of curiosity in my mind, provided me with learning opportunities that aided in increasing my efficacy and introduced me to concepts and knowledge that were alien to me. I am grateful to the following *gurus* that inspired me to work hard:

It was a few winters ago that out of boredom, I took a class in the Department of Educational Administration: School Finance with Dr. Sweetland. He encouraged me to undertake more courses in the department and who would have thought that a class taken

out of boredom using fee waiver will result in a doctorate. Thank you, Dr. Sweetland, for pointing me in the right direction. I took a series of courses in school law under the aegis of Dr. Daniels. He graciously served as an advisor for my M.A. in school administration and provided the impetus for doctoral studies. Words fail to describe the electric performance of Dr. Daniels teaching in the classroom. He is crème-de la- crème, and they do not make teachers like him anymore. Thank you, Dr. Daniels, for the rigor of your lessons. My committee member and another teacher par excellence, Dr. Beard who conducted the best educational policy seminar classes I have attended. Anytime I contacted her for help, she never declined and was always patient. Most importantly, she always reminds her students to get involved in educational policy. Now that I have some time, perhaps I can heed her advice.

I feel privileged to have had co-advisors for my doctorate. My co-advisor Dr. Anthony, under whom I took the lion's share of my classes. Anika's dedication to her scholarship, teaching, and advising duties is hard to surpass. At times when I wanted to transfer to the EdD program, she put her foot down and pressed me to complete the doctorate. Anika without your encouragement and undying support, this doctorate would have been very arduous and may be impossible, so thank you. My other co-advisor Dr. Goddard, under whose guidance as part of a graduate class I started this study. At every step of my learning process, he was there to help, whether it be teaching how to write items or contacting schools for data collection. His contagious enthusiasm especially when it comes to advanced statistical methods makes him endearing and motivating. He possesses the facility to explain extremely intricate analysis lucidly. In this regard, he

inspired me to get a graduate interdisciplinary minor in Quantitative Research Methods. Thank you, Dr. Goddard.

I would also like to thank Columbus City Schools and countless teachers that participated in this research. Some of these teachers work in stressful environments while also serving the urban poor. The dedication of CCS teachers is inspirational, and I am proud to have worked with them. Perhaps Coleridge was thinking of the selfless courage of these teachers when he penned that “work without hope draws nectar in a sieve and hope without an object cannot live.” Special Thanks to Mrs. Harris for the editorial help.

The educational path I took was hard, but friends like Dr. Righter and Dr. Hostuick made it a little easier and tolerable. Kathryn, thank you for sharing your collaboration data and all the statistical conversations. Katie, thanks for your support and the suggestions at various steps of this journey.

Saving the best for the last, I want to thank my partner Donald who stood by me through this whole process. Without your love, support, encouragement, and steadfast commitment I would not have been able to undertake this journey. Thank you.

Vita

July 31st 1977……Born, India

2000……..BA, Natural Sciences, University of Cambridge

2006 …….MSc, Chemistry, The Ohio State University

2008 …….MEd, Secondary Education, The Ohio State University

2014……..MA, Educational Administration, The Ohio State University

Publications

Concerning the Solid State Packing [(Bu^tCO_2)3M_2]$_2$ (9,10-anthracenedicarboxylate) Compounds (M=Mo or W) and Other Matters, Malcolm H. Chisholm, Matthew J. Byrnes, Ajatshatru Mehta and Patrick M. Woodward. Turning Points in Solid-State, Materials and Surface Science. Royal Society of Chemistry, 2008

Field of Study

Major Field: Educational Studies

Table of Contents

Abstract ii
Dedication iv
Acknowledgments v
Vita viii
List of Tables xii
List of Figures xiv
Chapter 1. Introduction 1
Teacher Efficacy 2
School Academic Press and Teacher Collaboration 3
Through the Looking Glass of Social Cognitive Theory 5
Problem Statement 7
Purpose of the Study 9
Hypothesis 10
Study Significance 10
Limitations 12
Delimitations 12
Definition of Key Terms 13
Chapter 2. Literature Review 15
Social Cognitive Theory and Concept of Self-Efficacy 16
Tautologic Application of Social Cognitive Theory to Study Schools 20
Theoretical and Conceptual Framework 22
Teacher Efficacy 26
Sources of teacher efficacy 27
Measurement dilemmas and debates associated with teacher efficacy 30
Teacher and School-Level Antecedents of Teacher Efficacy 37

Academic Press 41
Academic Emphasis or Press: Genesis of the Variable 42
Pivotal Studies about Academic Press 51
Teacher Collaboration in Teacher Based Teams 58
Definition of a Team 62
Types of Teams in Schools 64
Stages of Team Development 66
Collaborative Inquiry as a Framework of Teacher Based Teams 68
Advantages of Teacher Collaboration 70
Drawbacks of Teacher Collaboration 73
Factors that Facilitate Effective Teacher Collaboration 76
Studies Linking Teacher Efficacy, Teacher Collaboration, and Academic Press 78
Chapter 3. Methods 86
Introduction 86
Research Questions 86
Hypothesis 87
Sample for the study 87
Instrumentation 88
Cognitive Interviews and Field Test of Academic Press Scale 89
Academic Press 92
Teacher Collaboration 93
Teacher Efficacy 94
Teacher Demographic Variables 95
School Contextual Variable 96
Factor Analysis 97
Multi-level Analysis 103
Null or Unconditional Model 107
Within School Models 108
Full Model 112
Chapter 4. Results 116
Factor Analysis 116
Factor Analysis of Teacher Collaboration (TC) 117

Factor Analysis of Teacher Efficacy Scale (TE) 121
Factor Analysis of Academic Press Scale (AP) 125
Multilevel Modeling 132
Sample Characteristics 132
Teacher-level Variables 134
School-level Variables 138
Unconditional Model 141
Within Schools Models 142
Full Model 145
Chapter 5. Discussion 151
Summary of Findings 151
Sample and the Setting 153
Discussion of Factor Analysis Results 154
Discussion of Multilevel Analysis Results 157
Unconditional Model 157
Within-schools Model 158
Full Model 161
Implications for Future Research 163
Significance of the Study 165
Limitations 168
Conclusion 169
List of References 171

List of Tables

Table 4.1 Descriptive Statistics for Items of Teacher Collaboration Scale 118
Table 4.2 Correlation Matrix for Items of Teacher Collaboration Scale 119
Table 4.3 Exploratory Factor Analysis of Teacher Collaboration Scale 120
Table 4.4 Descriptive Statistics for Items of Teacher Efficacy Scale 122
Table 4.5 Correlation Matrix for Items of Teacher Efficacy Scale 123
Table 4.6 Exploratory Factor Analysis of Teacher Efficacy Scale 124
Table 4.7 Descriptive Statistics for Items of Academic Press Scale 126
Table 4.8 Correlation Matrix for Items of Academic Press Scale 127
Table 4.9 Factor Loadings for Two-Factor Solution of Academic Press Scale 128
Table 4.10 Exploratory Factor Analysis of Academic Press (AP) Scale 130
Table 4.11 Teacher Sample (n = 383) 133
Table 4.12 School Sample (n = 44) 134
Table 4.13 Descriptive Statistics for Teacher Collaboration and Teacher Efficacy (n = 383) 135
Table 4.14 Teacher Demographic Variables (n = 383) 136
Table 4.15 Correlations among Teacher-level Variables (n = 383) 137
Table 4.16 School-level Descriptive Statistics (n = 44) 139
Table 4.17 Correlations between School-level Variables (n = 44) 140
Table 4.18 Unconditional Model Characteristics: Variations between Schools in Teacher Efficacy: Model 1 (n = 383 teachers in 44 schools) 142
Table 4.19 Multilevel Analysis of the Effect of Teacher-level Demographic Variables on Teacher Efficacy (n = 383 teachers in 44 schools) 143
Table 4.20 Multilevel Analysis of the Effect of Teacher Collaboration on Teacher Efficacy: Model 2A and 2B (n = 383 teachers in 44 schools) 145

Table 4.21 Multilevel Analysis of the Effect of School-Level Contextual Variables on Teacher Efficacy (n = 383 teachers in 44 schools) 147
Table 4.22 Multilevel Analysis of the Effect of Teacher Collaboration and School Academic Press on Teacher Efficacy: Model 3A and 3B (n = 383 teachers in 44 schools) 148
Table 4.23 Model Fit Measures for All Models 149

List of Figures

Figure 2.1 Bandura's triadic reciprocal determinism 17
Figure 2.2 Hoy et al. version of teacher efficacy scale (Hoy & Woolfolk, 1993) 35
Figure 2.3 Model of academic press (Murphy et al. 1982) 44
Figure 2.4 Policies and practices that convey academic press (Murphy et al., 1982) 45
Figure 2.5 Health dimensions of organizational health index (Hoy et al., 2012) 48
Figure 2.6 Dimensions of the organizational climate index (Hoy et al., 1991) 49
Figure 2.7 Academic emphasis (from OHI) and academic press (from OCI) 51
Figure 2.8 Collaboration continuum as conceptualized in OIP (OLAC, 2013) 60
Figure 2.9 Little (1990) continuum of teacher collaboration 62
Figure 2.10 Vangrieken (2016) typology of teacher teams 65
Figure 2.11 Tuckman's team and group development model (Tuckman, 1965) 67
Figure 2.12 Bray (2000) five stages collaborative inquiry model 69

Chapter 1. Introduction

Since the last two decades, teacher turnover and attrition have plagued the teaching profession (Carver-Thomas & Darling-Hammond, 2017; Darling-Hammond, 2003; Ingersoll, 2001). The phenomena of teacher turnover and attrition have been so severe that some researchers have termed it a teaching crisis (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). According to most recent estimates, two-thirds of teacher vacancies are created by teachers that leave the teaching profession- most due to dissatisfaction (Carver-Thomas & Darling-Hammond, 2017; Simon & Johnson, 2015). More alarmingly, the turnover and attrition rates are highest in schools that primarily serve, students of color (Ronfeldt, Loeb, & Wyckoff, 2013). In such high-poverty, high-turnover schools, teachers are leaving at an alarming rate due to exhaustion and inexperienced and underqualified teachers are often hired to fill the teaching vacancies (Klusmann, Richter, & Lüdtke, 2016).

Teachers are the most crucial in-school influence on student achievement (Carver-Thomas & Darling-Hammond, 2017; Hoy, 2012), and research shows that high rates of turnover harm student achievement (Hanushek, Rivkin, & Schiman, 2016; Ingersoll & Smith, 2003). The school districts also bear the price of teacher turnover and attrition; by some estimates, teachers who leave can cost an urban district as much as $20,000 (Simon

& Johnson, 2015); funds that could have been utilized in providing resources for the urban schools.

Teacher turnover and attrition have been attributed primarily to teachers being dissatisfied, burned-out, and stressed due to the environment of the school (Borman & Dowling, 2008). The dissatisfied teachers reported feeling less efficacious about their abilities to influence student learning, also known as low teacher efficacy (Coladarci, 1992; Pas, Bradshaw, & Hershfeldt, 2012; Tsouloupas, Carson, Matthews, Grawitch, & Barber, 2010).

Teacher Efficacy

Teacher efficacy has been related to a myriad of student, teacher, and school-level constructs and the last 30 years have seen an active interest in the field of teacher's sense of efficacy (Tschannen-Moran & Hoy, 2001; Tschannen-Moran et al., 1998) and its relation to instructional practices (Allinder, 1994), adoption of innovations (Guskey, 1988), job-specific behaviors (Allinder, 1994; Coladarci & Fink, 1995), satisfaction, teacher turnover, attrition and teacher burn-out (Caprara, Barbaranelli, Steca, & Malone, 2006; Skaalvik & Skaalvik, 2017). Such widespread interest in teacher efficacy has also been fueled due to its association with student-level outcomes like student achievement (Ashton & Webb, 1986; Ross, 1992), and student behavior (Woolfolk & Hoy, 1990; Woolfolk, Rosoff, & Hoy, 1990).

Due to its relationship with the student, teacher, and school-level variables, teacher efficacy has proven to be a potent variable to conceptualize beliefs teachers have about their teaching capabilities. Ignoring the causality debate that has shadowed efficacy

research (Bandura, 1974, 1986a, 1995) and assuming that teacher efficacy beliefs are malleable and alterable (Tschannen-Moran et al., 1998), methods to alter teacher efficacy beliefs has been an active area of research. These quests to find the 'best' methods to affect teacher efficacy beliefs have led to a proliferation of teacher efficacy research especially among school leaders and researchers (Fives & Gill, 2014; Klassen, Tze, Betts, & Gordon, 2011; Kleinsasser, 2014; Wheatley, 2005; Zee & Koomen, 2016). Rightly so, because it is widely acknowledged that a school leader has an indirect influence on student achievement, and this influence tends to exert itself via the teacher and the school environment (Hallinger, 2003; Hallinger & Heck, 1996; Leithwood & Jantzi, 2008; Leithwood & Sun, 2018; Waters, Marzano, & McNulty, 2005; Witziers, Bosker, & Krüger, 2003).

To alter self or teacher efficacy beliefs, one needs to target one or more sources of efficacy: mastery experience, vicarious experience, social persuasion, and physiological cues (Bandura, 1997a; Tschannen-Moran & Hoy, 2001). Therefore, it is fitting to examine the influences on teacher efficacy through the filters of the four efficacy sources. This study examined the relationship between teacher efficacy and two crucial variables whose proliferation is under the hegemony of the school leader: school academic environment and teacher collaboration.

School Academic Press and Teacher Collaboration

In this study, school environment is conceptualized as the academic press of the school: a school-level variable that has been another perennial in the research landscape due to its well documented, positive, and significant association with student

achievement outcomes. Among the variants of constructs that have been used to conceptualize school environment, academic emphasis or press has been one of the most promising constructs to study the academic robustness of a school (Barron, 2014; Mitchell, Kensler, & Tschannen-Moran, 2015; Phillips, 1997). Schools with an environment of high academic press or emphasis have an orderly learning environment, where teachers hold high expectations for every student and where teaching time is respected. Such schools have policies, procedures, routines, and expectations that motivate the staff and students to create a robust, intellectually stimulating environment. For an observer, the mission of the school is clear, that the school is serious about its primary goal of teaching and learning (Hoy, Tarter, & Kottkamp, 1991; Murphy, Weil, Hallinger, & Mitman, 1982).

More importantly, academic press or emphasis, is one of the triumvirates of school-level variables (others being collective efficacy and faculty trust) that have an impact on student achievement irrespective of the student, or school SES, or demographic makeup of students, or teachers (Beard, Hoy, & Hoy, 2010; Hoy, 2012). This property has elevated academic emphasis or press as a powerful tool to study the academic milieu of schools, especially urban schools.

The second predictor used in this study, teacher collaboration, is a recent addition to the study of school systems and has been associated with an increase in student achievement outcomes (Goddard, Goddard, & Tschannen-Moran, 2007; Zee & Koomen, 2016) and with an increase in teacher efficacy beliefs (Goddard & Kim, 2018). The study of collaboration can be traced to research in organizational behavior and management

where it has been associated with an increase in productivity and efficiency (Bolman & Deal, 2017; Mattessich & Monsey, 1992; Pisano & Verganti, 2008). In the past, collaboration in schools has been criticized for being episodic, disjointed, and a one-time workshop model (Darling-Hammond, 1994; Darling-Hammond & Richardson, 2009). However, more recently, collaboration in schools has become more formal, structured and focused towards improving instruction (Goddard, Goddard, Eun Sook, & Miller, 2015; Goddard, Goddard, & Kim, 2015; Goddard & Kim, 2018) and is distinct from the antiquated model of intermittent teacher collaboration. For example, some teachers in Ohio schools are meeting in teacher-based teams (TBTs) for 120-180 minutes a month aiming to work collaboratively for improving student achievement. TBTs are a state required, mandatory component of a school's accountability measure also known as the Ohio Improvement Process (OIP) (Lloyd, McNulty, & Telfer, 2014; Ohio Department of Education, 2015b). As a part of the OIP, schools provide structured time for teachers to work collaboratively in Teacher-Based Teams (TBTs).

Through the Looking Glass of Social Cognitive Theory

The concept of self-efficacy as a barometer to gauge an individual's capability to perform a task owes its origin to Bandura's Social Cognitive Theory (Bandura, 1997a). Social Cognitive theory has been hailed as a paradigm shift in social psychology (Bandura, 2001; Pajares, 1996b) and since its inception has been actively used to study open social systems like schools (Gibson & Dembo, 1984; Goddard & Goddard, 2001; Guskey, 1988; Klassen et al., 2011; Tschannen-Moran et al., 1998; Woolfolk et al., 1990). Due to its ubiquitous nature, the concept of efficacy has been extended to students

as student efficacy (Pajares, 1996c; Schunk, 1991, 2015) and groups as collective-efficacy (R. D. Goddard et al., 2015; Goddard, Hoy, & Hoy, 2000, 2004; Moolenaar, Sleegers, & Daly, 2012). When using social cognitive theory to study teachers in schools, researchers have rightly substituted the concept of self-efficacy with teacher efficacy.

Bandura (1997) employed the idea of transactional interactions between self and society to explain the motivation and behavior that drive human functioning. Bandura posits that individuals are more likely to participate in activities for which they have a higher self-efficacy and will be less likely to engage in activities for which their self-efficacy is low (Wood & Bandura, 1989). At the core, the efficacy question is: Do I have the ability to execute the actions needed to accomplish a task? The answer to the question determines the action the individual takes to complete the task (Pajares & Schunk, 2001). Therefore, it is not surprising that teacher efficacy judgments are strongly related to decisions to stay in the teaching profession or feelings of stress or exhaustion (Chesnut & Burley, 2015; Evans & Tribble, 1986; Schwarzer & Hallum, 2008; Skaalvik & Skaalvik, 2017; Ware & Kitsantas, 2007). As beliefs of efficacy are self-beliefs, teacher efficacy represents the cognition or personal dimension of social cognitive theory.

Due to interactions between self and society, an individual is both, a product and a producer of their environment. Recall that efficacy beliefs occur in a social environment by mastery experience, by observing others, by social persuasions, and by physiological cues. Therefore, when observed through the looking glass of social cognitive theory, the power of normative environment of a school (academic press here), may be understood as the effect of social persuasion on teacher's efficacy perceptions (Goddard, Sweetland, et

al., 2000; Tschannen-Moran, Salloum, & Goddard, 2014) and in this way academic press represents the environmental dimension of social cognitive theory.

Similarly, formal teacher collaboration focused on instruction provides teachers with occasions for mastery learning, vicarious experiences, and social persuasion to strengthen their teaching efficacy. Formal teacher collaboration entails teacher behavior like analyzing and sharing student work with the team and thus represents the behavioral dimension of social cognitive theory.

Therefore, both collaboration (at the individual level) and school academic press (at group level) relate to various sources of teacher efficacy and offer promising constructs that can aid in strengthening teacher efficacy beliefs. In this regard, when applied to schools, social cognitive theory offers a promising framework to better understand the relationships between teacher efficacy, teacher collaboration, and school academic press.

Problem Statement

Though researchers have established a link between student achievement and teacher collaboration (Goddard et al., 2007), student achievement and teacher efficacy (Caprara et al., 2006; Moore & Esselman, 1992), and student achievement and academic press (Barron, 2014; Goddard, Sweetland, et al., 2000), little is known about interaction of teacher efficacy with teacher collaboration and school academic press especially in urban low performing urban schools. The decline of teacher efficacy most hurts such schools.

Understanding how teacher efficacy, teacher collaboration, and school academic press interact is of import to school leaders and researchers because creating an intellectually stimulating environment where teachers have high efficacy, where collaboration is valued, and where the emphasis is on pedagogy comes under the aegis of the school leader. The leader provides resources for collaboration and helps to formulate school policies and procedures that are followed by all members. These policies and procedures guide the conduct of the members, whether teachers or students, whether teaching students or collaborating with teachers.

However, little is known about the mechanisms through which school academic press and teacher collaboration may influence teacher efficacy beliefs. This study employed the lens of Bandura's social cognitive theory to study the schools as open social systems, and examine whether a triadic interaction exists between teacher efficacy, teacher collaboration, (individual characteristics) and school academic press or emphasis (organizational characteristic) (Bandura, 1994, 1997b, 2001; Wood & Bandura, 1989).

This study assessed teacher efficacy, teacher collaboration, and school academic press by surveying elementary school teachers in an Ohio urban school district. The items assessing teacher collaboration were precisely aligned with the tasks of Teacher based teams (TBT's) as directed in the Ohio Improvement Process. In this regard, the teacher collaboration discussed in this study is particular to formal teacher collaboration in TBT's about instruction.

As teachers are nested in the schools, this study employed multilevel modeling to account for the nesting or hierarchical nature of the data. Research has consistently

shown that individuals within a group tend to be more like each other regarding an outcome variable than they are to individuals in a different group (McCoach & Adelson, 2010; Snijders & Bosker, 2012) Therefore, ignoring such nesting of teachers in schools may lead to aggregation bias and ecological fallacies (O'Connell & McCoach, 2008). Also, multi-level modeling partitions the variability in the outcome variable (teacher efficacy) between teacher-level (teacher collaboration) and school-level (academic press) variables. This helps to explain the variation in teacher efficacy within and between schools by using teacher collaboration and academic press as predictors.

Purpose of the Study

The purpose of this study is to use social cognitive theory to investigate whether there is a significant variation in teacher efficacy within and between schools, and to examine if teacher collaboration and school academic press account for this variation in teacher's efficacy? Specifically, this study addressed the following sub-questions:

1. Does Teacher Efficacy vary within and between schools?
2. After controlling for teacher-level demographic variables (age, gender, level of education, total teaching experience and teaching experience at current school), if teacher efficacy still varies within schools, does teacher collaboration account for this variation?
3. After controlling for school-level contextual variables (average SES, prior achievement, percent students that are mobile or minority or gifted), if teacher efficacy still varies across schools, does school academic press account for this variation?

Hypothesis

As the variables of the study represent different units of analysis (teacher and school), hierarchical linear modeling (HLM) was employed to test the following hypotheses:

H1. Teacher Efficacy varies significantly within and between schools.

H2. After controlling for teacher-level demographic variables, teacher collaboration is a positive and significant predictor of variation in teacher efficacy.

H3. After controlling for school-level contextual variables, school academic press is a positive and significant predictor of variation in teacher efficacy.

Study Significance

This study uses social cognitive theory to observe the triadic relationship between teacher efficacy, teacher collaboration, and school academic press. The three variables used in the current study have been universal in school research and have continuously been related to improved student achievement even after controlling for student socioeconomic status (Hallinger, 2003; Hoy, 2012; Miller, Goddard, Goddard, Larsen, & Jacob, 2010).

Researchers tend to aggregate the individual level data to school-level data (Gray, Kruse, & Tarter, 2016; Hoy & Woolfolk, 1993), however, doing so can cause aggregation bias and lead to ecological fallacies. To add to the confusion, aggregation can also cause "phantom effects" (Televantou et al., 2015, p. 82). In order to avoid such bias and confusion and to also address the "enduring methodological dilemma in school research:

namely the unit of analysis problem" (Goddard, Sweetland, et al., 2000, p. 694) this study employed multilevel modeling. Another methodological improvement in the current study is the construction and use of reliable scales that accurately measure the three variables and reflect the self and group referent perceptions (Goddard & LoGerfo, 2007). Stated another way, the teacher-level scale items reflect teacher opinion of self and school-level scale items represent teacher's opinion about their school. Doing so the current research addresses the 'measurement issues' that have stymied research based on self and group referent beliefs (Goddard et al., 2004).

This study has significant implications for urban school leaders that are responsible for schools' improvement process and academic success. The troika of variables under study has been the *sine qua non* in the creation of effective schools for poor urban students (Edmonds, 1979; Hallinger & Murphy, 1986; Hoy, 2012; Phillips, 1997; Rosenholtz, 1985). The results of the study will help urban school leaders in creating a school environment that emphasizes academics and fosters teacher collaboration. In this process, these urban schools also tap into the elixir for teacher burnout, exhaustion, turnover and, attrition, i.e., increased teacher efficacy.

Lastly, the study utilizes the model of collaboration that is structured and based on the framework of teacher-based teams. The model of collaboration is still in its infancy, and little is known if teacher collaboration in TBT's is affecting teacher efficacy. This is true for urban, low performing schools that serve the poorest of the poor (i.e., schools that are in the direst need of efficacious teachers). This study attempted to illuminate the relationship between teacher efficacy and teacher collaboration to observe if teacher

collaboration has any effects on teacher efficacy in urban, high poverty, low performing schools.

Limitations

This study's limitation involves the type of sample and instruments used. This study draws a non-random and convenient sample of teachers from urban elementary schools in Ohio; school district under study has been one of the poorest and lowest performing school districts in the state.

As the study was conducted using schools that might be considered outliers, the generalizability of the study is limited to similar settings. Only the principals that allowed the researchers to administer the surveys during the staff meeting were selected. Though the scales used to measure school academic press and teacher efficacy can be generalized to any teacher and school in the United States, the scale used to measure teacher collaboration is specific to the model of teacher collaboration adopted by the state. Furthermore, all three scales measured teachers' perceptions or beliefs, and it is assumed that these are valid feelings and not guesswork or lies.

Delimitations

The study is delimited to select urban elementary schools. This delimitation helps to control for urban/suburban and elementary/middle/high school differences that may arise. This will also limit the generalizability of findings to urban elementary schools. The teachers from the suburban, middle or high schools may bear different beliefs about these variables and will not be represented by this sample.

Definition of Key Terms

Academic Press: Academic press or emphasis, is the extent to which the environment of a school makes academic achievement a priority as to the function of a school (Goddard, Sweetland, et al., 2000). Academic learning time for students is essential because the time students spend successfully and actively engaged in an academic task relates positively to student learning (Weinstein, Mignano, & Romano, 2011). In the current study, the terms academic press and academic emphasis are used interchangeably and represent a school-level variable.

Self-Efficacy: Self-efficacy beliefs are defined as, "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1989, p. 4).

Teacher Collaboration: Teacher collaboration is defined as a "process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own" (Schrage, 1990, p. 38).

Teacher Efficacy: Teacher efficacy can be defined as a "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (Guskey & Passaro, 1994, p. 4). Therefore, it is not surprising that "teacher sense of efficacy is consistently and positively related to student achievement" (Beard et al., 2010, p. 1137).

Team: Team is defined as a "collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen

by others as an intact social entity embedded in one or more larger social systems, and who manage their relationships across organizational boundaries" (Cohen & Bailey, 1997, p. 242).

Chapter 2. Literature Review

This section reviews the literature about the three variables: teacher efficacy, teacher collaboration, and academic press or emphasis. Utilizing the self-efficacy beliefs from social cognitive theory, this review traces the origins, meaning, and measures of teacher efficacy. The theoretical framework of social cognitive theory (SCT) was employed to examine the proposed relationship between teacher efficacy, teacher collaboration, and school academic press. In this study, the environmental component of SCT is represented by school academic press or emphasis. This review examines the origin and unification of the two terms: academic emphasis and academic press and also presents an account of notable studies involving academic press. The model of teacher collaboration studied here is specific to the collaborative behavior of teacher-based teams (TBTs) and thus reflects the behavioral component of SCT. The review considers teacher collaboration in light of TBTs and elaborates on various factors that hinder or enhance teacher collaboration. Lastly, the review elaborates on notable previous studies that have examined the linkages between the trifecta of variables used in this study: Teacher Efficacy (TE), Teacher Collaboration (TC) and school Academic Press (AP).

Social Cognitive Theory and Concept of Self-Efficacy

Bandura (1997), employed the idea of transactional interactions between self and society to explain the motivation and behavior that drive human functioning and learning. Unlike behavior theorists, social cognitive theorists like Bandura contend that human functioning and learning occur in a social environment by observing others (Bandura, 1988; Schunk, 2015). Through this observational learning, individuals acquire knowledge, skills, rules, strategies, attitudes, beliefs, and appropriateness of various behaviors. As a result, human functioning and behavior are a product of the complex reaction of personal, behavioral, and environmental factors. Bandura called this interaction between personal (and other cognitive factors), behavioral, and environmental factors: Triadic Reciprocal Determinism (Bandura, 1986b, 1988; Pajares, 1996a; Wood & Bandura, 1989). As shown in Figure 2.1, interactions between the three factors help an individual determine the actions needed to learn or perform a behavior at a designated level.

In the model of triadic reciprocal determinism depicted in Figure 2.1, all three factors (personal, behavioral, and environmental) operate as interacting determinants and influence each other bidirectionally. According to Bandura (1999), such reciprocal causation does not imply that the direction and magnitude of these three sources of influences are always the same; at any given time one factor may predominate and be stronger than others. Nor does reciprocal causation mean that the reciprocal influences co-occur (Bandura, 1997b; Pajares, 1996c). It takes time for a causal factor to exert its influence on other factors and activate the reciprocal influences. According to Bandura,

individuals “function as contributors to their own motivation, behavior, and development within a network of reciprocally interacting influences” (Bandura, 1999, p. 169). Ergo, individuals’ actions are socially rooted and operate in the socio-cultural realms, thereby making individuals both products and producers of their own environment.

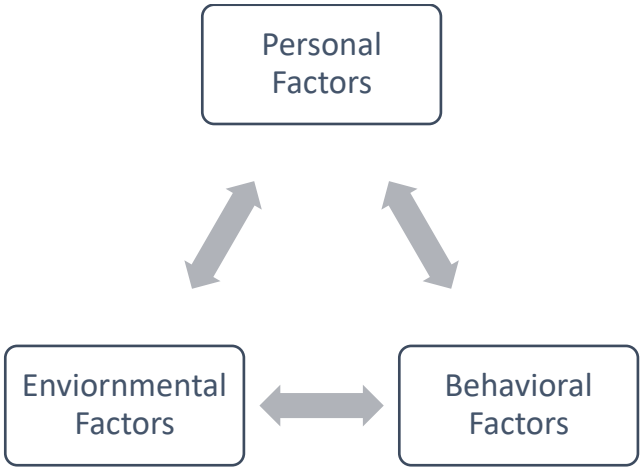

Figure 2.1 Bandura’s triadic reciprocal determinism.

Since its proposal, social cognitive theory has been used successfully in diverse fields to explain the relationship between behavior, self-beliefs, and environmental factors. For example, SCT has been used by clinicians to study smoking cessation (Garcia, Schmitz, & Doerfler, 1990), phobias (Bandura, 1983), depression (Davis & Yates, 1982), social skills (Moe & Zeiss, 1982), assertiveness (Lee, 1983), and pain management (Manning & Wright, 1983). It has been used to study organizational behavior (Gist & Mitchell, 1992; Wood & Bandura, 1989) and is related to employee

productivity (Bandura, 1988), career choices and attendance (Frayne & Latham, 1987), and adaptability to new technology (Gist & Mitchell, 1992).

One of the key processes that affect people's beliefs about themselves is the beliefs about self-efficacy (Bandura, 1989, 1997b; Schunk, 2015). Self-efficacy refers to an individual's belief that he or she can do a task. Self-efficacy beliefs are "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1989, p. 4). For example, the belief of a smoker that he or she can quit is an efficacy judgment and these efficacy beliefs to quit smoking influence the effort the smoker will exert towards quitting. In general, self-efficacy beliefs influence the choices people make, the goals people will set up for themselves, the amount of effort they will exert to meet those goals, the number of times they will persevere during adversity, the level of stress and depression they will feel, and the level of resilience to failures they will experience (Bandura, 1997b; Hoy, Miskel, & Tarter, 2012; Tschannen-Moran et al., 1998). Individuals are more likely to participate in activities for which they have a higher self-efficacy and are less likely to engage in activities for which their self-efficacy is low (Wood & Bandura, 1989). In toto, self-efficacy beliefs affect our thought pattern and our reactions to events.

Judgments of self-efficacy are measured on three basic dimensions of magnitude, strength, and generality (Bandura, 1994; Pajares, 1996b). The magnitude of self-efficacy refers to the level of task difficulty, i.e., if the task is easy to accomplish or hard. The strength of self-efficacy highlights the amount of conviction an individual has about performing a task successfully at a varying level of difficulty. A higher sense of self-

efficacy is associated with greater perseverance and more likelihood that an activity will be performed successfully. Lastly, the generality or predictive power of self-efficacy beliefs tend to depend on the task. An individual may be more efficacious in one task than another, i.e., an individual may not assess himself/herself as efficacious in every task.

Bandura (1997b) identified four primary sources of information that individuals employ to create their judgments of self-efficacy: mastery experience, modeling or vicarious experiences, verbal persuasion, and physiological arousal. The experience of success or failure to complete a task known as mastery experience is a crucial source of efficacy beliefs as it provides authentic evidence of whether one can muster what it takes to succeed. Successes tend to build a more robust sense of efficacy while failure tends to undermine it. However, there are also situations in which a person learns by observing a model or expert do a task. These vicarious experiences affect self-efficacy as they provide knowledge, strategies, and skills needed to perform the task in the future.

Furthermore, having an expert or a model perform a task offers a social comparison to the observer. By observing someone else perform a behavior, individuals can convince themselves that if others can do it, they can also achieve some improvement in their own performance. Within realistic bounds, social or verbal persuasion in the form of talking people into believing that they can achieve what they want to accomplish can also increase self-efficacy beliefs.

The physiological reactions to the success or failure of one's actions can be either positive arousal like happiness, excitement, and enthusiasm, or negative feelings such as

fear, stress, and anxiety. Above all, enthusiasm and positivity or tend to increase self-efficacy beliefs whereas tasks that invoke pessimism tend to diminish self-efficacy beliefs (Bandura, 1997b). Recall that Bandura identified mastery experience and physiological reaction to activity as the most potent sources of efficacy beliefs.

However, just having the sources of self-efficacy will not result in an individual feeling efficacious. In this regard, social cognitive theory contends that the information acquired from the sources is cognitively appraised by an inferential process in which an individual weighs and combines contributions of personal, behavioral, and environmental factors (Bandura, 1999) to decide the best course of action.

Tautologic Application of Social Cognitive Theory to Study Schools

Schools are rightly viewed as open social systems where the input, environment, and output are in equilibrium. During last 40 years, in K-12 educational settings, social cognitive theory and self-efficacy beliefs have been used to study a myriad of relationships among and between the student, teacher, and school-level variables (Pajares, 1996a, 1996c; Pajares & Schunk, 2001; Tschannen-Moran & Hoy, 2001). Notably, at the student level, researchers have explored the relationship between students' self-efficacy beliefs and career choices (Lent & Hackett, 1987), motivation (Pajares & Schunk, 2001; Schunk, 1981, 1991; Schunk, Pintrich, & Meece, 2008), goal setting (Wood, Mento, & Locke, 1987), problem-solving (Bouffard-Bouchard, 1990), test anxiety (Pajares & Miller, 1994), and students' academic performance and achievement (Pajares, 1996a, 1996c; Pajares & Schunk, 2001; Schunk, 1981, 1991).

At the teacher level, the last 40 years also witnessed an active interest in the field of teacher's sense of efficacy (Tschannen-Moran & Hoy, 2001; Tschannen-Moran et al., 1998), and its relation to instructional practices (Allinder, 1994), adoption of innovations (Guskey, 1988), job-specific behaviors (Allinder, 1994; Coladarci & Fink, 1995), and also to various student-level outcomes like student achievement (Ashton & Webb, 1986; Ross, 1992), and student behavior (Woolfolk & Hoy, 1990; Woolfolk et al., 1990).

In summary, it is well accepted that a teacher's beliefs about his or her teaching capabilities is a critical factor that impacts their behavior. An efficacious teacher is confident in his or her teaching methods, is responsive to the learning needs of every student, and is unfazed by disruptive, unmotivated, or difficult students (Tschannen-Moran & Hoy, 2001). When used in school settings, teacher efficacy beliefs have proven to be a well-researched substitute for self-beliefs: personal factors in social cognitive theory (Bandura, 2001). Therefore, four sources that activate self-efficacy beliefs: mastery experience, vicarious experience, social persuasion, and physiological states can also be used to study the variations in teacher efficacy beliefs (Schunk, 2015).

Stated another way, the four sources of teacher efficacy offer excellent pathways to explore the relationship between teacher efficacy and other teacher and school-level variables. It can be said, that for an attempt to successfully alter teacher efficacy beliefs, the most facile pathway is through one of the four sources of teacher efficacy: mastery or enactive experience, vicarious experience, social persuasions, and physiological arousal.

Theoretical and Conceptual Framework

A theory provides a lens to view a research problem and aids in understanding what is happening. Specifically, in quantitative research, a theory is an interrelated set of constructs or variables that are formed into hypotheses and specify/explain the relationship between variables (Creswell & Creswell, 2017). In this study, social cognitive theory as defined by Albert Bandura (Bandura, 1986b, 1988) is used to examine the relationship between teacher efficacy, teacher collaboration, and school academic climate or press.

As the primary function of schools is pedagogy, it is fitting to study the pedagogical focus of the school or academic press of a school as an indicator of the academic environment of the school. Academic press or emphasis describes characteristics of a school's academic milieu and is defined as the degree to which the school environment forces (presses) students to obtain high achievement standards and for all adults to strive for academic excellence. Such high standards are achieved by having policies, procedures, expectations, rules, and rewards that motivate the school (students and staff) to create a robust intellectually stimulating learning environment where student academics is a priority and learning is celebrated (Lee, Smith, Perry, & Smylie, 1999; Murphy et al., 1982).

To this end, academic press exerts a normative influence in the school that influences the behavior and beliefs of teachers, students, and other school members (Bryk, Camburn, & Louis, 1999; Goddard, Sweetland, et al., 2000). As teachers are not "social isolates immune to the influence of those around them" (Bandura 1991, p. 469),

from a social cognitive perspective, one expects that school academic press as an environmental factor will influence teacher efficacy beliefs. One can posit that from the tetrad of sources of strengthening efficacy beliefs, school academic press will operate through social persuasion to alter teacher's efficacy beliefs.

Teacher collaboration in schools has come a long way from the one-stop, intermittent workshop or informal model (Darling-Hammond, 1994) to the presently used formal and structured model of collaboration focused on instruction (R. D. Goddard et al., 2015). So much so that presently, as part federal and state regulations and teacher evaluation rubrics, teacher collaboration has taken a prominent role in schools (Ohio Department of Education, 2015a, 2016b). This role is well earned as research on outcomes of teacher collaboration has been mostly positive, though researchers have cautioned that for teacher collaboration to bear fruits of labor, collaboration has to be clearly defined, structured, and implemented properly (Ostovar-Nameghi & Sheikhahmadi, 2016; Vangrieken, Dochy, Raes, & Kyndt, 2015; Voogt, Pieters, & Handelzalts, 2016). For example, in the state of Ohio, some teachers are meeting monthly for 120-180 minutes in teacher base teams (TBTs) and collaborating towards improving instruction and student achievement. In the TBTs, teachers utilize an iterative 5-Step collaborative process that entails teachers bringing student pre and post assessment data to be analyzed by the team, sharing samples of student work with the team, implementing agreed upon instructional practices, and designing lessons based on student strengths and weaknesses (Ohio Department of Education, 2015b). Teacher collaboration as implemented in TBT's is structured around common scripts, norms, and specific steps,

subsequently, teacher collaboration in TBTs is formal, structured, and focused on instruction: critical dimensions of teacher collaboration scales (R. D. Goddard et al., 2015; Goddard et al., 2007; Goddard & Kim, 2018; Goddard, 2010; Sehgal, Nambudiri, & Mishra, 2017).

It can be seen that the model of collaboration as envisioned in teacher-based teams represents tasks that teacher and the teams indulge in and share. The iterative 5-step process that TBTs engage in represent actions and behavioral aspect of teacher collaboration. For this reason, one can envision teacher collaboration as an arm of the behavioral factors described by the social cognitive theory. From a socio-cognitive perspective, for teacher collaboration to impact teacher efficacy beliefs, teacher collaboration needs to tag to one of the sources of teacher efficacy beliefs. A formal, structured collaboration where teachers are analyzing their instruction also leads to a mastery learning experience for teachers. The time spent in TBT's is rife with opportunities for teachers to learn from each other (vicarious learning). When teachers interact with each other, colleagues can also serve as a suitable model for vicarious learning experiences for the teacher. These mastery and vicarious experiences, in turn, strengthen the teacher's efficacy beliefs.

Furthermore, teacher collaboration in TBT's also offers ample opportunities for verbal feedback, encouragement, praise, and support from colleagues thereby opening the social persuasion route to strengthen teacher efficacy. Lastly, TBT's cannot be insular to the normative force of school academic press. Instead, such regular meetings offer perfect

forums for teachers and teams to be influenced by a school's climate and culture, i.e., the environment.

It is important to note, however, that a mere presence of an environment of policies and procedures that emit academic emphasis or support teacher collaboration is not sufficient to alter the beliefs or behaviors of teachers and students. Social norms provide the momentum for alteration of individual behavior in society (Coleman, 1988; Goddard, 2001). Goddard (2001) utilized the concept of norms from social psychology to explain how norms in schools influence the behavior of teachers. A social norm is an expectation of appropriate behavior that occurs in a group context. Norms not only entail what is appropriate behavior but these expectations, in turn, define the actions and identity of the group. Deviation from social norms can lead to informal social sanctions or even more formal exclusion from the group (McDonald & Crandall, 2015). Accordingly, the severity of the social sanctions will be proportional to the effect of norm-breaking on the group (Goddard, 2001).

This study posits that school academic press and teacher collaboration operating via social persuasion may have an impact on teacher efficacy beliefs. Structured teacher collaboration in TBT's also offers mastery and vicarious learning experiences for teachers to reinforce their teaching efficacy beliefs. This study explored if these conceptual pathways relating teacher efficacy with teacher collaboration and school academic press can explain the variation in teacher efficacy beliefs.

Teacher Efficacy

Over the last 40 years, the concept of teacher efficacy has received considerable attention as it is related to various student, teacher, and school-level constructs (Ashton & Webb, 1986; Ross, 1994; Skaalvik & Skaalvik, 2017). Much like the self-efficacy beliefs, teachers' sense of efficacy are beliefs that teachers hold about their capabilities to influence student learning. Tschannen-Moran and Hoy (2001) defined teacher's efficacy as a "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (p. 786). Literature is replete with various terms used to describe teacher's efficacy beliefs, viz. teachers' sense of efficacy, self-efficacy of teachers, instructional efficacy, teachers' efficacy beliefs, or teachers' perceived efficacy. Despite, Woolfolk-Hoy 's advice to not use the term teacher efficacy as it can be confused with teacher effectiveness (Shaughnessy, 2004), due to the ubiquitous use of the concept, the term teacher efficacy is now widely accepted, primarily to represent personal teaching efficacy (Goddard & Kim, 2018; Liu & Hallinger, 2018).

Since its inception, the teacher's sense of efficacy has been related to various behaviors of teachers and student learning. Efficacious teachers tend to persist with struggling students (Gibson & Dembo, 1984), tend to be less critical when students commit a mistake (Ashton & Webb, 1986), tend to experiment with novel instructional methods (Berman, 1977; Guskey, 1988) , tend to be more open towards collaboration (Rosenholtz, 1989a, 1989b; Rosenholtz & Simpson, 1990), tend to seek improved teaching methods (Guskey, 1988), tend to be resilient (Tschannen-Moran & Hoy, 2001),

and tend to have higher professional commitment (Coladarci & Fink, 1995; Evans & Tribble, 1986; Trentham, Silvern, & Brogdon, 1985). Teacher efficacy is positively related to trust (Goddard, Tschannen-Moran, & Hoy, 2001), to positive attitude towards educational reform (De Mesquita & Drake, 1994), to more satisfaction (Lee, Dedrick, & Smith, 1991), and to increased parental involvement (Hoover-Dempsey, Bassler, & Brissie, 1992).

Furthermore, classrooms of efficacious teachers tend to be organized (Allinder, 1994), and have a playful, activity-based, student-centered, learning environment with a humanistic approach to classroom management (Czerniak & Schriver, 1994; Enochs, Scharmann, & Riggs, 1995; Woolfolk et al., 1990). At the student level, teacher's sense of efficacy is related to student achievement (Armor et al., 1976; Ashton & Webb, 1986; Ross, 1992), positive behavior (Tsouloupas et al., 2010), motivation (Midgley, Feldlaufer, & Eccles, 1989), and students' sense of efficacy (Anderson, Greene, & Loewen, 1988; Schunk, 1981, 1991). The impressive record of accomplishment of teacher efficacy's association with positive student and teacher outcomes has catapulted teacher efficacy as a perennial in the education research landscape. Methods and mechanisms to alter or study variance in teacher efficacy beliefs have become of import. According to the tenets of social cognitive theory, the nucleus of such efficacy alterations are the four sources of teacher efficacy beliefs.

Sources of teacher efficacy

Analogous to self-efficacy beliefs, the four sources of teacher's efficacy beliefs about their teaching capabilities are mastery experience, vicarious experience, social persuasion, and physiological cues. Out of these four sources, teacher efficacy is most directly influenced by mastery experiences and the physiological arousal associated with those experiences (Goddard & Goddard, 2001; Guskey & Passaro, 1994; Ross, 1994; Tschannen-Moran & Hoy, 2001). This is understandable as teaching is a performance-oriented profession in which 5-6 times daily, a teacher performs solo in the classroom. According to SCT, positive performances induce a feeling of confidence and lead to the repetition of such activities, while failure tends to induce an avoidant stance towards the activity (Bandura, 1986a). For the current study, the formal structure of teacher collaboration in TBTs where teachers bring and share student work, analyze student data together, and co-plan about instruction offers enactive attainments or mastery experience in the planning and pedagogical aspects of the profession. Stated another way, formal collaboration studied here, also offers mastery learning opportunities for teachers, that informal and disjointed collaboration may have lacked.

One may believe that the egg-crate architecture and cellular organization of schools lead to teacher isolation and fewer opportunities for social persuasion or vicarious experiences (Ostovar-Nameghi & Sheikhahmadi, 2016). However, teacher collaboration in TBTs can act as a catalyst in the growth of efficacy beliefs via vicarious experiences as the collaboration offers teachers opportunities to learn from coaches and colleagues (David, 2009; Goodnough, 2005; Nelson & Slavit, 2008). In such experiences,

a teacher can learn the right strategies to complete a task by observing other teachers or models that also serve as a social comparison tool. Such observational experiences give the teacher the confidence that if other teachers can do it, they can at least achieve some improvement in their performance.

Pre-service teacher training offers novice teachers many opportunities to observe the mentor teacher. This serves as an excellent source of vicarious learning for novice teachers in cultivating their teacher efficacy. Unfortunately, as pre-service teachers transition to their own classrooms, opportunities for vicarious learning such as co-teaching, coaching, and observing other teachers diminish because they are not the norm in every school (Tschannen-Moran et al., 1998). Thus, present education policies like OIP that focus on formal teacher collaboration centered around instruction offer a potent source of vicarious learning for both novice and experienced teachers.

Verbal persuasion such as encouragement or positive feedback from other teachers, administrators, parents, and students can be a potent boost for teacher efficacy beliefs provided such appraisal is within realistic bounds, and the source is a credible and trustworthy expert (Ross, 1994). Such persuasive boosts can propel a teacher to work hard or try new strategies; but if the feedback is harsh and critical, it can also lower efficacy beliefs of a teacher (Schunk et al., 2008). Though one might erroneously believe that the solitary nature of teaching offers limited opportunities to teachers for verbal persuasion from adults, verbal or social persuasions is omnipotent and omnipresent in social systems where it can morph as social norms and normative behavior of the team. This normative force can be the academic press of the school or the formal structure of

TBTs. Later parts of this chapter will address the social norms and persuasion with academic press and teacher collaboration.

Lastly, the difficulty of the task and temporal position of success or failure during the task also affects teacher efficacy (Tschannen-Moran & Hoy, 2001). For example, teacher efficacy is increased when success is achieved on an arduous task without much help from others or when success occurs early in the learning. On the other hand, teacher efficacy is decreased when the teacher fails in the task or when that failure occurs relatively early in the learning process (Hoy et al., 2012).

Merely having sources of efficacy beliefs will not lead to either improved teacher efficacy or exhibition of desired teacher behavior. These efficacy beliefs have to undergo cognitive appraisal to determine the course of action an individual will take (Bandura, 1989, 1994). For example, teachers with a higher sense of efficacy will set higher goals for themselves (and their students), will work to achieve those goals, and will persist despite initial failures (Tschannen-Moran & Hoy, 2001). Through motivational processes, the efficacious teachers are more likely to ascribe failure to insufficient effort rather than to ability and are more willing to accept the responsibility for student outcomes rather than blaming factors outside of their control. (Ross, 1994). A teacher with higher efficacy will be more resilient, committed, and satisfied with the profession. Thus, beliefs in their efficacy play a pivotal role in choosing the type of activities teachers participate in and the type of environment they will produce in their classrooms and schools (Pajares, 1996c).

Measurement dilemmas and debates associated with teacher efficacy

Teacher efficacy has been called an elusive construct (Tschannen-Moran & Hoy, 2001) and associated with measurement dilemmas (Henson, 2001). Much like the construct of self-efficacy, debate has been ongoing about the causal nature, meaning, and measurement of teacher efficacy (Bandura, 1974, 1986a, 1995; Henson, 2001; Pajares, 1996a, 1996b, 1996c; Ross, 1994; Tschannen-Moran & Hoy, 2007; Tschannen-Moran et al., 1998).

Since its inception in the 1970s, numerous attempts have been made to conceptualize and measure teacher efficacy. In this regard, various scales have been proposed, and countless articles have discussed the merits and shortcomings of these scales (Guskey & Passaro, 1994; Henson, 2001; Ross, 1994; Tschannen-Moran & Hoy, 2001; Tschannen-Moran et al., 1998). Irrespective of the items used, teacher efficacy scales are broadly based on either Rotter's Locus of Control Theory or Bandura's Social Cognitive Theory.

One of the first attempts to measure teacher efficacy was by RAND cooperation (Armor et al., 1976). These RAND measures of teacher efficacy consisted of only two items and were based on the locus of control theory by Rotter (Rotter, 1966). Rand researchers defined teacher efficacy as the extent to which teachers believed that they could control the reinforcement of their actions. The items were intended to assess whether a teacher believed that student learning and motivation (reinforcers for teacher) were under teacher's control or the control of the environment and hence outside the control of the teacher.

Rand Item 1. “When it comes right down to it, a teacher cannot do much because most of a student’s motivation and performance depends on his or her home environment.”

Teachers that agreed with the first item show that they believe that reinforcement of their teaching efforts lie outside their control or is external to them. Environmental factors like socio-economic status, home, and community environment have a stronger effect on student learning and motivation. Such teacher beliefs about the powers of external factors are now labeled as general teacher efficacy (GTE) (Ashton, 1984).
Rand Item 2. “If I really try hard, I can get through to even the most difficult or unmotivated students.”

Teachers that agreed with the second item indicate that they believe that reinforcement lies within the control of the teacher, i.e., is internal. Such teachers believe that they have skills, strategies, and training to reach even the most unmotivated and disengaged students. In this item teachers are making a judgment about their own teaching efficacy; and therefore, this factor is now also known as personal teaching efficacy (PTE) (Tschannen-Moran et al., 1998).

Despite methodological and statistical concerns of using a two-item scale, the two RAND items have been used to correlate efficacy with a range of other variables like student achievement (Ashton & Webb, 1986), teacher commitment, teachers’ willingness to implement innovation, and teachers’ level of stress (Smylie, 1988). Encouraged by the success of the studies based on a two-item scale, researchers started to develop more long and comprehensive measures like teacher locus of control measure (Rose & Medway, 1981), responsibility for student achievement measure (Guskey, 1981) and Webb’s

efficacy scale (Ashton, 1984). Much like the two strands of the DNA, two RAND items laid the foundation for bifurcation of the term teacher efficacy into personal teaching efficacy and general teaching efficacy.

Gibson and Dembo (1984) expanded RAND items using the conceptual underpinnings of Bandura's social cognitive theory to develop a 30-item Teacher Efficacy Scale. Factor analysis of the scale consistently showed the presence of two factors namely, personal teacher efficacy and general teacher efficacy. When social cognitive theory is used to analyze the Gibson and Dembo's teacher efficacy scale, personal self-efficacy beliefs will reflect teachers' evaluation of their abilities to bring about positive student change irrespective of the level of motivation or engagement of the student. Consequently, this factor is like RAND item 2 that reflected internal locus of control. The second factor, general teaching efficacy, would reflect the degree to which the teacher believes that environment could be controlled, i.e., the extent to which students can be taught, given such factors such as family background, student IQ, and conditions of the school. Hence, this factor is similar to RAND item 1 that dealt with an external locus of control. The meaning of this second factor has been a well-documented bone of discord between researchers (Bandura, 1986a; Woolfolk & Hoy, 1990) as some have also described it as outcome expectancy (Enochs et al., 1995; Gibson & Dembo, 1984) or external influences (Emmer & Hickman, 1991).

Due to this second factor, Gibson and Dembo's scale initially suffered from "psychometric infirmities" such as poor construct and factorial validity (Henson, 2001; Henson, Kogan, & Vacha-Haase, 2001; Pajares, 1996a, 1996c; Ross, 1994; Tschannen-

Moran & Hoy, 2001). Initially, both factors accounted for less than 30% variance. Specifically, researchers determined that the second factor (GTE) suffered from measurement errors and questionable construct validity, so much that Henson et al. (2001) discouraged researchers from using the second factor in teacher efficacy research. Hensen et al. (2001) emphasized better and more reporting of exploratory and confirmatory factor analysis results of teacher efficacy scales. Similarly, Gibson and Dembo (1984) recommended continued psychometric assessments of the teacher efficacy scale using different populations and settings.

Despite conceptual confusions, Gibson and Dembo's scale and its versions have been extensively used to study teacher efficacy and its relation to the various student, teacher, and school-level variables (Henson, 2001; Kleinsasser, 2014; Ross, 1994; Tschannen-Moran & Hoy, 2001). In this regard, the scale has gone through various iterations by utilizing only items with highest factor loadings to reduce the number of items from 30 to 10 presently used items representing teacher efficacy (Hoy & Woolfolk, 1993; Soodak & Podell, 1993; Woolfolk et al., 1990). Figure 2.1 shows the 10-item teacher efficacy scale based on Hoy and Woolfolk's (1993) version of the original Gibson and Dembo's scale. In this often used 10-item, 2-factor solution scale, five items measure general teaching efficacy, and five items gauge personal teaching efficacy.

Personal Teaching Efficacy (PTE) scale

1. When I really try, I can get through to most difficult students.
2. If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.
3. If I really try hard, I can get through to even the most difficult or unmotivated students.
4. If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly.
5. If one of my students couldn't do a class assignment, I would be able to accurately assess whether the assignment was at the correct level of difficulty.

General Teaching Efficacy (GTE) Scale

1. The amount a student can learn is primarily related to family background.
2. If students aren't disciplined at home, they aren't likely to accept any discipline.
3. A teacher is very limited in what he/she can achieve because a student's home environment is a large influence on his/her achievement.
4. If parents would do more for their children, I could do more.
5. When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment.

Figure 2.2 Hoy et al. version of teacher efficacy scale (Hoy & Woolfolk, 1993).

Researchers have either used the sum of scores on two factors to conceptualize teacher efficacy or have used only scores from the personal teaching efficacy scale while defining teacher efficacy. The present study uses the latter approach because teacher efficacy as conceptualized in this paper is a teacher's self-belief, devoid of factors that are beyond the realms of teacher's control. This helps to eliminate the psychometric infirmities that are associated with the second factor of general teaching efficacy. The teacher scale used in this study is a 4-item personal teacher efficacy scale (Goddard et al. 2000) derived from the 5-item scale proposed by Hoy et al. (1993). Goddard et al. (2001), used this four-item scale to extract a single factor that explained 42% variation in scores

of teacher efficacy scale. The items in the scale had a factor loading of 0.62 - 0.70 and alpha coefficient of reliability was 0.79, much above the acceptable value of 0.70, suggesting that all four items had high internal consistency.

In addition to the measurement issues, causal inferences of self-efficacy beliefs have also been termed as a thorny problem in self-efficacy belief research (Pajares, 1996a, 1996b, 1996c). In the chicken or egg question involving origin and direction of causality, "one must wonder whether feeling good about oneself is primarily responsible for increased achievement or whether successful performance is largely responsible for stronger feelings of self-worth" (Pajares, 1996b). Concerning teacher efficacy, whether positive collaborative behavior in teacher-based teams (TBTs) is responsible for an increase in teachers' belief about their teaching efficacy or whether teachers that are efficacious about their teaching practices are more likely to share such practices with their peers and hence report higher levels of collaborative behavior. Due to the reciprocal interaction between personal factors (like teacher efficacy) and behavioral factors (like teacher collaboration) as proposed by social cognitive theory, such causality questions involving efficacy beliefs are hard to resolve and have plagued the discussion since the inception of the concept (Bandura, 1974, 1983, 1986a, 1995).

However, the meteoric rise of methodological and computational advances in causal modeling, path diagrams, directed acyclic graphs (DAGs), and confirmatory factor analysis (CFA) have aided in making causal inferences in self-efficacy research (Bandura & Locke, 2003; Murnane & Willett, 2010; Pajares, 1996b). Furthermore, social cognitive theory asserts that reciprocal causation does not mean that the reciprocal influences occur

concurrently. It takes time for a causal factor to exert its influence on other factors and activate the reciprocal influences (Bandura, 1997b, 1999).

Teacher and School-Level Antecedents of Teacher Efficacy

The tetrahedron of the sources of teacher efficacy is supported by teacher and school-level characteristics that also serve as antecedents of teacher efficacy. Personal characteristics like gender, years of experience, and teacher training have an impact on teacher efficacy (Klassen et al., 2011; Tschannen-Moran & Hoy, 2007). In general, females report higher teacher efficacy beliefs than males (Anderson et al., 1988; Evans & Tribble, 1986; Klassen & Chiu, 2010; Raudenbush, Rowan, & Cheong, 1992; Riggs, 1991). This is understandable as culturally teaching has been considered a female's profession and schools tend to have more female than male teachers. Although more recent studies have reported no differences in teacher efficacy by gender (Tejeda-Delgado, 2009; Yeo, Ang, Chong, Huan, & Quek, 2008).

The study of ebb and flow of efficacy beliefs as teachers transition from pre-service, to novice, and experienced teachers, has been an active area of research (Klassen et al., 2011; Tschannen-Moran & Hoy, 2001). This is understandable because teacher efficacy is positively associated with a pantheon of student outcome variables. So, any effort to alter the teacher efficacy beliefs, offers school researchers and leaders a facile, albeit indirect path to student outcome, especially achievement.

It is observed that teacher efficacy beliefs follow a nonlinear path as teachers progress in their careers. Teacher efficacy beliefs are most malleable early in learning; and once efficacy beliefs are established, they are hard to alter (Bandura, 1997b; Gist &

Mitchell, 1992; Tschannen-Moran et al., 1998). That is, as teacher experience increases, personal teaching efficacy tends to increase while general teaching efficacy tends to decrease. This decline in general teaching efficacy and an increase in personal teaching efficacy with experience is understandable because teachers are becoming more familiar with their role and the schools' role in student's education. With experience, teachers become more proficient with classroom management and pedagogy, thereby increasing their teaching efficacy. With this experience, teachers also start to realize that some students have serious problems that can be attributed to home factors and are beyond the control of the teacher or school. Over time such thinking erodes general teaching efficacy (Enochs et al., 1995; Hoy & Woolfolk, 1993). As school leaders have little control to alter general teachers' efficacy and keeping with the present research tradition (Goddard & Goddard, 2001; Goddard & Kim, 2018), this study measures personal teaching efficacy beliefs as a teacher's efficacy beliefs.

Much like its relationship to teaching experience, the relationship between teacher efficacy and grades taught is complex and non-linear. For example, Bandura (1983), proposed a quadratic relationship between grades taught and teacher efficacy. In a study of elementary schools, kindergarten teachers reported lower teaching efficacy than first-grade teachers, while in grades 2-6, teacher efficacy decreased. In kindergarten, the students are starting in school and are beginning to learn appropriate behavior. This can overwhelm the teacher and hence account for lower teacher efficacy in kindergarten. Such student impediments start to diminish by first grade, thereby increasing teacher

efficacy; but in grades 2-6, due to the increase in academic demands and widening of the achievement gap, teacher efficacy tends to decline.

In general, elementary school teachers tend to report higher teacher efficacy than middle or high school teachers (Klassen & Chiu, 2010; Nathaniel et al., 2016; Tschannen-Moran & Hoy, 2007). This can be attributed to structural differences between elementary and higher grades. Unlike high schools where teaching is subject specific, in elementary grades, the same teacher tends to teach most of the subjects, thereby spending more time with the same students. Therefore, elementary teachers tend to be more familiar with student needs and feel more capable of their teaching practices. To that end, this study was conducted on the teaching efficacy beliefs of elementary teachers: the career stage where efficacy is high and malleable.

In addition to above mentioned teacher demographic variables, school's contextual variables that influence teachers efficacy beliefs have been an active area of research and pursuit (Chong et al., 2010; Collie, Shapka, & Perry, 2012; Hoy & Woolfolk, 1993; Moore & Esselman, 1994; Pas et al., 2012; Skaalvik & Skaalvik, 2017). Rosenholtz and Simpson (1990) studied organizational antecedents to teacher efficacy and proposed that school-wide management of student behavior, parental involvement in the school, productive collaboration with other teachers, and receiving positive feedback had a direct effect on elementary teacher efficacy.

Raudenbush et al. (1992) also reported similar findings on the effects of the school environment on teacher efficacy. In a sample of 315 high school teachers from 16 schools, they used hierarchical linear modeling (HLM) to account for variation in teacher

efficacy across classes and between schools. According to them, environment, where teachers are provided with technical support to enact their preferred teaching strategies, an environment where teachers experience supportive leadership, and an environment that presents opportunities to participate in instructional decision making, may enhance self-efficacy. Deemer (2004), also reached similar conclusions that in perceived supportive school culture, teachers' instructional practices in the classroom were focused on demonstrating ability and such teachers also reported higher levels of personal efficacy.

Godard and Goddard (2000) investigated the relationship between teacher efficacy and school-level variables such as prior achievement, proportion student's minority, proportion students from low SES and collective efficacy in urban schools in the United States. They utilized multilevel modeling to predict school-level variables that can account for between-school variance in teacher efficacy and reported significant variation among school means for teacher efficacy. More importantly, neither prior achievement nor mean SES were significant predictors of teacher efficacy in the combined model while collective efficacy was positively and significantly associated with teacher efficacy and a one standard deviation increase in collective efficacy was associated with .25 standard deviation increase in teacher efficacy. In the final model, collective efficacy accounted for nearly three-fourths of the variation among schools in teacher efficacy.

Unlike Goddard et al. (2000), Solomon, Battistich, and Hom (1996) postulated that the socio-economic status of the school is associated with specific teacher beliefs and

practices. They observed that, after controlling for achievement, teachers working in low socioeconomic schools had lower expectations for their students than teachers working in middle-class schools. However, in their studies, Solomon et al. (1996) used a composite of teacher attitude and perceptions whose one of the many dimensions was teacher efficacy. It was reported that teacher attitudes and beliefs about the importance of teacher authority and constructivist beliefs had a significant relationship with school SES and no mention was made of the association of teacher efficacy per se with school SES. To compound the matters, the authors failed to account for multicollinearity issues that may have arisen due to concurrently using highly collinear variables in regression analysis. The last section will also look at some more studies that have related teacher efficacy with other school-level variables.

Academic Press

Academic press sometimes referred to as academic emphasis, is the extent to which the environment of a school makes academic achievement a priority for the school. (Goddard, Sweetland et al., 2000). Academic press describes characteristics of a school's academic environment or climate and is defined as the degree to which the school environment forces (presses) students to obtain high achievement standards and for all adults to strive for academic excellence. Such high standards are achieved by having policies, procedures, expectations, rules, and rewards that motivate the school (students and staff) to create a robust intellectually stimulating learning environment where student academics is a priority and learning is celebrated (Lee et al., 1999; Murphy et al., 1982). Stated another way, academic press exerts a normative influence in the school that

influences the behavior of teachers, students, and other school members (Bryk et al., 1999). As one of many measures of school climate, the academic press is a school-wide, not individual, characteristic (Hoy, Smith, & Sweetland, 2002) and an important variable that accounts for a school's effectiveness (Alig-Mielcarek & Hoy, 2005).

Academic Emphasis or Press: Genesis of the Variable

Though the terms academic press and academic emphasis are now used interchangeably (Beard et al., 2010; Hoy, 2012), initially both terms were two different strands; one emanating from the effective school research of the 1970s (Coleman, 1968; Edmonds, 1979; Murphy et al., 1982; Weber, 1971) and the other from organizational research (Hoy et al., 1991; Hoy & Woolfolk, 1993). Since inception, exploring school environment that has a positive effect on student achievement has been an active area of research (Y. L. Goddard et al., 2015; Gray et al., 2016; Hallinger & Murphy, 1986; Hoy, 2012; Leithwood & Sun, 2018). Academic press or emphasis has proven to be a widely used variable to conceptualize a school's academic environment.

Weber (1971), Brookover et al. (1978), Murphy et al. (1982), and Edmonds (1979) extensively studied effective schools and observed that all effective schools had strong instructional leaders who provided an orderly learning environment, set high academic expectations for staff and students, implemented pedagogical activities which aided in learning, and oversaw the frequent evaluation of student skills.

Later works by Edmonds (1979) on urban, poor, but effective schools strengthened Weber's findings that effective schools have specific traits which correlate well to academic achievement. These characteristics include:

1. Strong administrative leadership
2. High expectations for student achievement
3. An orderly school environment conducive to learning
4. Emphasis on skill acquisition
5. Frequent monitoring of progress.

Murphy et al. (1982) progressed the effective school research by proposing mechanisms through which school academic press might operate. They reached similar conclusions as Weber and Edmonds when understanding school characteristics that contribute to school effectiveness. In a study of a school effectiveness program, Murphy et al. included school policies and classroom practices into their theoretical framework of academic press. Murphy et al. argued, "school policies that promote the belief that all students can achieve grade-level objectives (for instance, mastery learning) convey to all that the school expects, demands, and works to ensure high levels of student achievement for all students" (p. 24). The working model proposed by Murphy et al. demonstrates how academic press is created and promoted in schools (Figure 2.3).

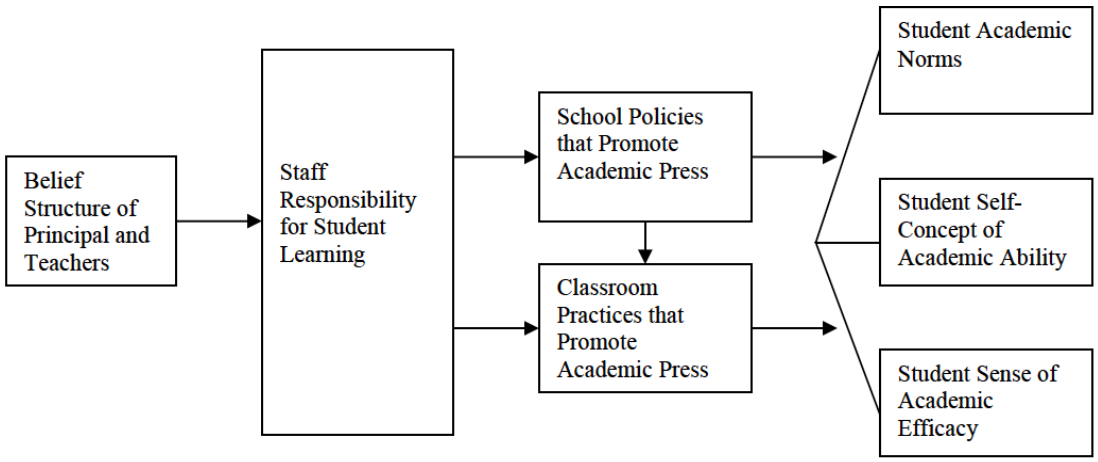

Figure 2.3 Model of academic press (Murphy et al. 1982).

This model bridges beliefs of staff with staff responsibilities, school policies, and classroom practices that promote academic press. In this model, school-level policies and enforcement practices form the backbone for the classroom level policies and expectations. Figure 2.4 summarizes some key policies and practices which Murphy et al. proposed that contribute to academic press in classrooms and school. Murphy et al. emphasized that the policies and practices that convey school academic press are critical variables that influence behaviors that contribute to the school's effectiveness. These characteristics help to operationalize the term academic press as "the degree to which environmental forces press for achievement on a school-wide basis" (p. 22). Furthermore, Murphy et al. stressed that the concept of academic press is broader than staff expectations and includes school policies, practices, expectations, norms, and rewards.

School Policy	Classroom Practices
Policies on School Function and Structure School Purpose Student grouping Protection of instructional time Orderly environment	Establishing an academically demanding climate Conducting an orderly well-managed classroom
Policies on Student progress Homework Grading Monitoring progress Remediation Reporting progress Retention/ promotion	Ensuring student's academic success Implementing instructional practices that promote student achievement Providing opportunities for student responsibility and citizenship

Figure 2.4 Policies and practices that convey academic press (Murphy et al., 1982).

Research related to school effectiveness showed that aspects of academic press such as high expectations, mastery orientation, an orderly learning environment, and essential skill acquisitions formed the foundation of effective schools. However, most of the effective school research focused on schools that can be classified as outliers on the school effectiveness continuum (Hallinger & Murphy, 1986; Murphy et al., 1982; Weber, 1971). For example, researchers narrowly focused on schools that were considered as already being effective in teaching every child. Additionally, a lack of robust statistical and research methods at the time of the studies limited the broader interpretation of the results. Therefore, for some time there remained a void in the literature on how the academic process operates and affects student achievement.

The 1990s ushered in an era of computational advances in educational research that made data analysis facile. Methods like factor analysis, hierarchical linear modeling, and structural equation modeling started to be used in analyzing educational data (Hoy &

Adams, 2015; Kerlinger & Lee, 2000; Lomax & Schumacker, 2004; Willms & Raudenbush, 1989). More importantly, researchers started to acknowledge the multilevel nature of schools and these computational advancements offered avenues to explore the relationship between macro or group level constructs and micro or individual level constructs.

During this era of advancements, scholars also began using the organizational climate as a lens and theoretical framework to understand best the workings of schools (Bryk et al., 1999; Hallinger & Murphy, 1986; Hoy & Fedman, 1987). The theoretical framework of using climate to study organizations traces its roots in the fields of industrial and social psychology, where researchers study perceptions of behavior using survey research and multivariate statistics (Hoy et al., 1991).

Tagiuri (1968, p. 24) described the climate of an organization as an "enduring quality of an organization, the dominant patterns of behavior that offer an organization its distinctiveness or feel." Forehand and Von Haller (1964) defined organizational climate as "those characteristics that distinguish the organizations from other organizations and that influence the behavior of people in an organization" (p. 363). Organizational climate has also been described by using an individual's personality metaphor. In this metaphorical comparison, personality is to the individual as climate is to the organization (Tagiuri, 1968). Ergo, an organization, much like an individual, can be characterized as having an open or closed personality (Halpin & Croft, 1962).

Hoy and Feldman (1987) expanded on the concept of organizational openness and developed the Organizational Climate Description Questionnaire (OCDQ) instrument to

measure climate as it related to schools as organizations. The OCDQ for the elementary, middle schools measures important aspects of teacher-teacher and principal-teacher interactions to understand the openness of the behaviors of teachers and administrators in a school organization.

Researchers have also employed a health metaphor to describe the nature of interpersonal relationships as they relate to organizational climate. Based on the relationships between members, the health of an organization can be classified as healthy or unhealthy. A healthy climate in an organization promotes productive interpersonal relations that lead to growth and development of all. Miles (1969) described a healthy organization as one that "not only survives in its environment, but continues to cope adequately over the long haul, and continuously develops and extends its surviving and coping abilities" (p. 378).

To study the nature of schools as evolving open social systems, Hoy and Feldman (1987) employed the health metaphor to examine the school climate. They proposed that healthy schools need to adjust in response to their environment- set, implement, and reach goals, maintain solidarity within the school, and create a unique value system. According to Hoy (2012), "A school with a healthy organizational climate is the one that copes successfully with its environment as it mobilizes its resources and efforts to achieve its goals" (p. 80)

Hoy and Fedman (1987) conceptualized seven dimensions of school health spread over the three levels in organizational health inventory (OHI) questionnaire. Figure 2.5 summarizes the seven dimensions of the Organizational Health Inventory (OHI), and as

evident, Hoy et al. measured academic emphasis as a school's press or quest for achievement. In schools with high academic emphasis, the classroom environment is orderly, free of interruptions, teachers believe that their students can learn, high but achievable academic goals are set for students, and students work hard to achieve those goals and respect those who do well in academics. Hoy et al. (1987, 1998) originally administered the OHI survey to 3,000 teachers in 87 middle schools and found that even after controlling for students' SES, all the dimensions of school health, except for institutional integrity, were positively related to student achievement in reading and mathematics. Academic emphasis, especially, showed the strongest correlation with student achievement (r = .73 for mathematics, p < .01).

Level	Dimension	Imperative Function
Institutional	Institutional Integrity	Adaptation
Managerial	Resource Support Initiating Structures Principal Influence Consideration	Adaptation Goal Achievement Integration and Latency Integration and Latency
Technical	Morale Academic Emphasis	Integration and Latency Goal Achievement

Figure 2.5 Health dimensions of organizational health index (Hoy et al., 2012).

Researchers soon realized that both the personality and health metaphors are useful in understanding the openness and interpersonal relations within a school. Though openness and interpersonal relations are distinct, there is some overlap in the two

constructs. As Hoy and Sabo (1998) said, “open schools tend to be healthy and healthy schools tend to be open” (p. 9). In this regard, Hoy et al. (1998) proposed a parsimonious view of school climate that considers both the health and personality of a school. Hoy, Tarter, and Kottkamp (1991) and Hoy and Sabo (1998) created the Organizational Climate Index (OCI), which operates at four levels and captures both personality and health of a school. These four levels include the institutional, managerial, teacher, and student levels. Using second-order factor analysis, they decomposed the many dimensions of open and healthy school climate measures, to manageable four dimensions: institutional vulnerability (later called environmental press (Sweetland & Hoy, 2000), collegial leadership, professional teacher behavior, and academic press (Figure 2.6).

Level	Dimension	Relationship
Institutional	Institutional Vulnerability	School and Community
Principal	Collegial Leadership	Principal and Teachers
Teacher	Professional Teacher Behavior	Teachers
Student	Academic or Achievement Press	School and student

Figure 2. 6 Dimensions of the organizational climate index (Hoy et al., 1991).

In summary, academic emphasis variable originated from the concept of school health while academic press variable was extracted from the concept of school climate and encompasses academic emphasis, school leadership, and instructional support (Hoy

& Sabo, 1998). To offer clarity on the distinction, Figure 2.7 compares the items of Academic Emphasis (from OHI Elementary school survey (Hoy & Fedman, 1987)) with items from Academic Press (from OCI Elementary schools survey (Hoy et al., 1991)). Though the two terms have distinct origins, as the concept of academic focus of a school gained prominence, the use of two terms: academic press and academic emphasis became ubiquitous and interchangeable to describe the academic climate of the school (Beard et al., 2010; Hoy et al., 2012; Sweetland & Hoy, 2000). One can describe a school with high academic press or emphasis as a school that "sets high but achievable academic standards and goals. Students persist, strive to achieve, and are respected by each other and teachers for their academic success. Parents, teachers, and principal all press students for high standards and school improvement" Hoy and Sabo (1998, p. 69).

Items on Academic Emphasis (OHI Elementary Survey)	Items on Academic Press (OCI Elementary Survey)
Students try hard to improve on previous work	The school sets high standards for academic performance
Students are cooperative during classroom instruction	Academic Achievement is recognized and acknowledged by the school
Students respect others who get good grades	Students seek extra work so that they can get good grades
Students seek extra work so that they can get good grades	Parents exert pressure to maintain high standards
Students neglect to complete homework	Students respect others who get good grades
	Students try hard to improve on previous work
	Parents press for school improvement
	Students in this school can achieve the goals that have been set for them.

Figure 2.7 Academic emphasis (from OHI) and academic press (from OCI).

Pivotal Studies about Academic Press

Shouse (1996) examined the conflict between school academic press and the sense of community while accounting for the SES of the school. He developed a measure for academic press and sense of community using the first follow-up data from the National Education Longitudinal Study of 1988 (NELS: 88). In the study, mathematics scores from the NELS:88 were used as the dependent variable, and independent variables consisted of academic press and communality. Academic press

consisted of items describing academic climate, disciplinary climate, and teacher instructional practices, and emphasis in a school. The community index used indicators representing shared values, common agenda of activity, and ethics of caring and collegiality.

Using hierarchical linear models (HLM) to reveal the three-way interaction between school academic press, sense of community and school SES, Shouse observed:

1. Significant links between the academic press and student achievement
2. Academic press had the most significant effect among low SES schools
3. In low SES schools with a weak academic press, a powerful sense of community may hurt achievement, and
4. For low and middle SES schools, the highest achievement effects are observed when there is a potent combination of academic press and community.

In a similar study, Phillips (1997) compared the merits of communitarian climate and academic climate on students' mathematics achievement and attendance. In this regard, Phillips collected longitudinal data on three cohorts of students from suburban middle schools consisting of African American students. Academic press was measured using a combination of teachers' expectations from teacher reports; the percent of students taking algebra in the eighth grade (from school records), and the number of hours students reported doing homework per week (students' estimations). Specifically, teachers were asked what percentage of the students in their school they expected to complete high school and what percent of students would complete a four-year college degree. The communitarian measure included the teachers' beliefs about shared values,

democratic governance, and positive teacher relationships and students' beliefs about teachers' caring. Using hierarchical linear modeling (HLM), Phillips concluded that the communitarian climate was not related to student attendance or mathematics achievement. Instead, academic press was positively related to both attendance and mathematics achievement. Also, Philips observed that one standard deviation increase of academic press score would increase math achievement by one-fourth of a standard deviation.

Lee et al. (1999) further explored how the social support a student receives for academics is related to their achievement in mathematics and reading. They hypothesized that social support and academic press are positively related to achievement and the relationship between social support and learning is stronger in schools with a more academic emphasis. Using hierarchical linear modeling (HLM), they analyzed the data from a 1997 survey collected by Consortium for Chicago School Research. Lee et al. defined academic press as the pressure "the school exerts on its students toward learning activities and performance" (p. 908). The academic press variable as used in this study was a school-level composite score consisting of teacher and student responses to survey that gauged "the extent to which teachers feel their school's goal, and actions are focused on improving student learning" and "whether students feel their teachers challenge them to reach high levels of academic performance" (p. 9). The researchers found that the relationship between social support and learning is dependent on the type of school students attended (schools characterized as having low, medium, or high academic press). Students with much social support learned more if they also attended a school with a high

academic press, while students with little social support that attend a school with the low academic press will be at a disadvantage. The combined statistical model of social support and academic press revealed positive and significant gains in math and reading and level of school academic press.

Goddard, Sweetland, et al. (2000) employed Bandura's social cognitive theory to explain the development and effect of academic emphasis on student achievement. Using hierarchical linear modeling (HLM), Goddard et al. analyzed the nested data compiled from 45 urban schools with 444 teacher surveys and the academic achievement scores of students in the third and fourth grade. They used Hoy and Feldman (1987) academic emphasis measure as conceptualized in the Organizational Health Inventory for elementary schools (OHI-E). As the academic emphasis is considered a school-level construct, teacher responses were aggregated at the school-level to obtain a school's composite academic emphasis score. Goddard et al. reported that academic emphasis was positively associated with the differences in student achievement scores in reading and mathematics that occur between different schools. Specifically, using various student and school-level control variables like students' race/ethnicity, students' SES, and students' prior achievement, they demonstrated that a one standard deviation increase in school's academic emphasis score is related with a 40% of standard deviation increase in mathematics score, and almost a one third standard deviation increase in reading scores.

The academic press variable from the Organizational Climate Index was employed by Hoy, Smith, et al. (2002) to study student achievement in high schools. This study was conducted using 97 high schools in Ohio where teachers responded to items

about the academic press and collective efficacy to test if the academic press and collective efficacy of a high school were associated with school's achievement in mathematics. The schools' SES and mathematics proficiency data were also collected and analyzed. Using correlational and path analysis, the researchers concluded that after controlling for SES, the academic press of the school is positively and significantly related to the higher degree of school's achievement in mathematics (r = .44, p <. 01). They observed a similar relationship between the greater collective efficacy of the school and the school's increased achievement in mathematics (r =. 61, p < .01). Utilizing path analysis, the study demonstrated that SES, academic press, and collective efficacy explained 45% of the variance in school mathematics score (r = .68, p<. 01) and the academic press did not have a direct effect on mathematics achievement instead it influenced the mathematics achievement through collective efficacy.

Alig-Mielcarek and Hoy (2005) examined how the instructional leadership of the principal and academic press of the school affected student achievement. Like others before, they also found that after controlling for SES, the academic emphasis had a significant positive relationship with student achievement. Using structural equation modeling, they found that academic emphasis had a direct effect on achievement, while instructional leadership did not. Instead, instructional leadership worked through academic emphasis to influence student achievement. Principals indirectly influenced student achievement because teaching and learning is the domain of teachers. Therefore, any principal effect on student achievement will be mediated by teacher-level variables.

More recently, Mitchell, Kensler, and Tschannen-Moran (2015) have shown that school academic press consists of three observed variables: teacher academic press, parent academic press, and student academic press. Using the survey data from teachers, parents, and students of elementary and middle schools in a large urban district, the authors concluded that instructional leadership, school academic press, and SES explained 84% of the variance in student achievement with school academic press making the most substantial contribution. According to the authors, the school academic press presents a more holistic view of the academic press as it takes the beliefs of all the stakeholders (teachers, students, and parents) into account.

Apart from student achievement, the level of the academic press in schools also influences student attendance (Phillips, 1997), and student academic orientation (Huang, Waxman, & Wang, 1997). Furthermore, as the level of the academic press in school increases, the rate of student behavior problems tended to decrease, and the likelihood of dropping out of school also decreased (Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; Bryk & Thum, 1989; Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013). Academic press is also related to other variables such as collective efficacy, faculty turnover, and school environment (Bevans, Bradshaw, Miech, & Leaf, 2007; Tremblay & Leblanc, 2007; McNeal, 1997).

A discussion of academic emphasis or press whether at the teacher or school-level will be incomplete without mentioning two promising second-order constructs that have emanated from academic press or emphasis. Recall that this section traced the genesis of academic press variable from the effective school research of the 1960s. Since then

researchers have been trying to conceptualize a multitude of characteristics of effective schools to a manageable 'set.' Based on more than 40 years of empirical research, Hoy, and Hoy (2011, 2012) proposed one such latent second-order construct called academic optimism, a collective property of schools. They reported that even after controlling for the socio-economic status of the students, three highly correlated variables: academic emphasis, faculty trust in students and parents, and efficacy beliefs, whether at teacher-level or school-level, were consistently linked to student achievement.

Beard et al. (2008) further extended the concept of school academic optimism to teacher-level and isolated a construct called teacher's sense of academic optimism that embodies the idea of teacher's positivity and optimism and their synergistic benefits. Teacher sense of academic optimism can be defined as "a teacher's belief that she can make a difference in the academic performance of students by emphasizing academics and learning, by trusting parents and students to cooperate in the process, and by believing in her ability to overcome difficulties and react to failure with resilience and perseverance"(Hoy, Hoy, & Kurz, 2008, pp. 4-5). The concept is rooted in humanistic and positive psychology but can be a powerful tool when examining student achievement in schools especially schools, that serve urban, poor students. Recall in Chapter 1 it was proposed that merely having walls of a school radiating academic emphasis is not enough to explain the positive outcomes observed in high performing urban schools that serve students of low socio-economic status.

Academic emphasis has to interact with other variables to show its potent and synergistic effects. Perhaps it is a teacher's sense of academic optimism in some of the toughest schools that motivate teachers to keep on trying despite pessimism, gloom, and failure. In such schools, a normative environment of academic press and mutual trust helps to strengthen efficacy beliefs of the teachers and motivates them not to give up and be positive. Needless to say, research about higher order constructs such as academic optimism is significant but still in a nascent stage.

As is evident the list of advantages of school environment of high academic press or emphasis is vast. To maintain focus on the influence of academic press on teacher-level variables, the latter part of this chapter will examine some seminal works that have linked academic press with teacher collaboration and teacher efficacy beliefs.

Teacher Collaboration in Teacher Based Teams

Collaboration is one of the terms used to describe a characteristic of a functional teacher based team (Lloyd, McNulty, & Telfer, 2009). Other terms include communication, coordination, cooperation, and collegiality. The term collaboration is also used in conjunction with terms like teams, groups, and Professional Learning Communities (PLCs), that are more formalized structures to facilitate collaboration. With all the nomenclature possibilities, only the concept of collaboration that pertains to teacher collaboration in Teacher Based Teams (TBTs) are discussed here (Ohio Department of Education, 2015b).

Often people confuse the term collaboration with other concepts describing team behavior such as cooperation or collegiality. According to Pollard (2005), collaboration is the pinnacle of a team's function that is inherent in the interdependency of their work. At this level in a team, structures and routines have been established for communication, and data and information are being shared to create new insights and dialogues. Goals, resources, and responsibility for outcomes are shared with team members. It is also at the functioning level of collaboration that one can observe the synergistic effect of teamwork. Schrage (1990) described collaboration as

> "a process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event. In this sense, there is nothing routine about it. Something is there that was not there before". (p. 38)

Teacher collaboration can be conceptualized as a collaboration continuum shown in Figure 2.8. This continuum depicts collaboration originating from the lowest level of communication, progressing through coordination and cooperation, and reaching the zenith of the collaboration level. At the highest level, structures and routines have been established for communication and shared goals, shared resources, and shared responsibility are the norms. Work is interdependent in such teams and sharing and creating new insights is of paramount importance (Lloyd et al., 2014; Ohio Leadership Advisory Council, 2013; Righter, 2017).

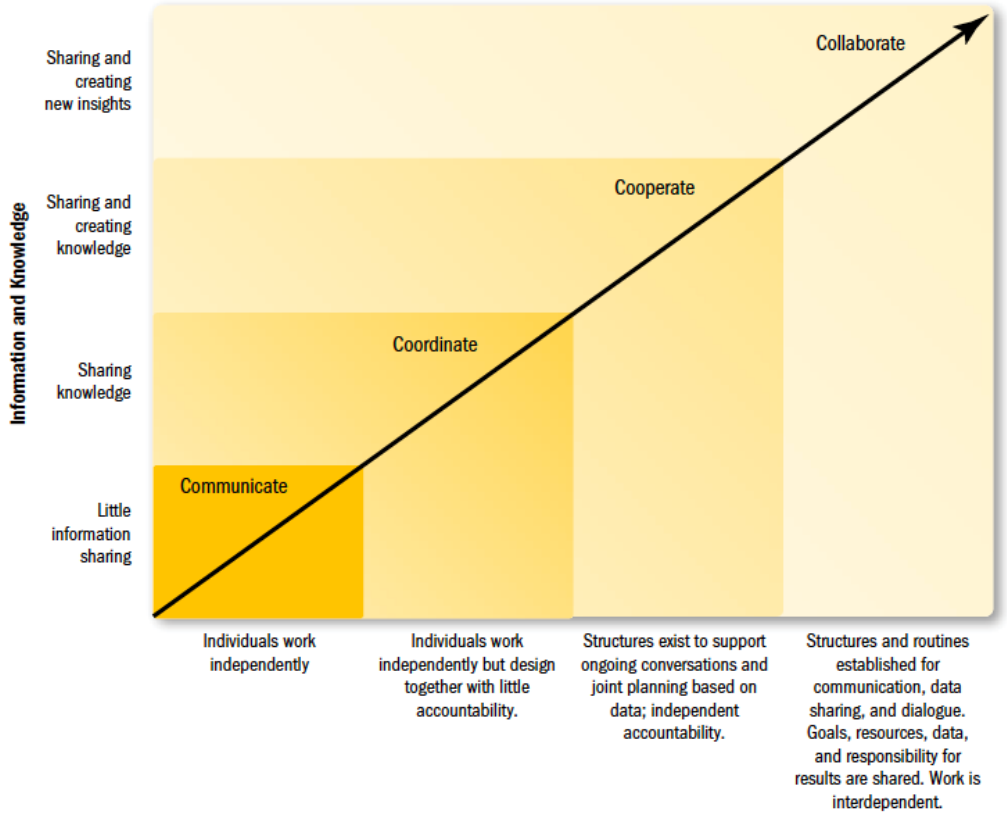

Figure 2.8 Collaboration continuum as conceptualized in OIP (OLAC, 2013).

Collaboration is also used interchangeably or in conjunction with terms like cooperation and collegiality. Cooperation denotes a working relationship with individuals that share a common goal (Pollard, 2005). In a team where members are cooperative, structures exist to support ongoing conversations and joint planning based on data, and the information is shared and created. Cooperation tends to signify a relationship that involves "giving and taking" (Bruner, 1968; Twidale et al., 1997). In cooperation, teachers share resources and exchange lesson plans but do not explore the problem at a deeper level. Though both collaboration and collegiality are dependent on the working

culture and organizational contexts of schools, the two terms are distinct. Kelchtermans (2006) in an extensive review of teacher collaboration and collegiality, defined teacher collaboration as job-embedded cooperative actions and collegiality as the quality of the relationships among school staff. In this regard, collaboration is a descriptive term relating to the actions of individuals while collegiality carries a positive value and suggests a normative dimension referring to a school's organizational culture.

Within the construct of collaboration, Little (1990, 2002) described four types of collaborative activities that foster teacher professional development (Figure 2.9). These collaborative activities include:

1. teachers engaging in frequent, continuous, and increasingly concrete and precise talk about teaching practice (storytelling and scanning);
2. teachers are often observing and providing useful critiques of their teaching (aid and assistance);
3. teachers planning, designing, researching, evaluating, and preparing teaching materials together (sharing); and
4. teachers teaching each other the practice of teaching (joint work).

Depending on the demands for collective autonomy and teacher-to-teacher initiative, we can place collaboration on a continuum ranging from independence to interdependence. Using this continuum as proposed by Little (1990), independence includes storytelling and scanning for ideas. On the opposite end of the continuum, interdependence includes sharing and joint work. Later, Smith (2009) expanded the

continuum of collaboration described by Little, by adding teamwork as the highest level of interdependence.

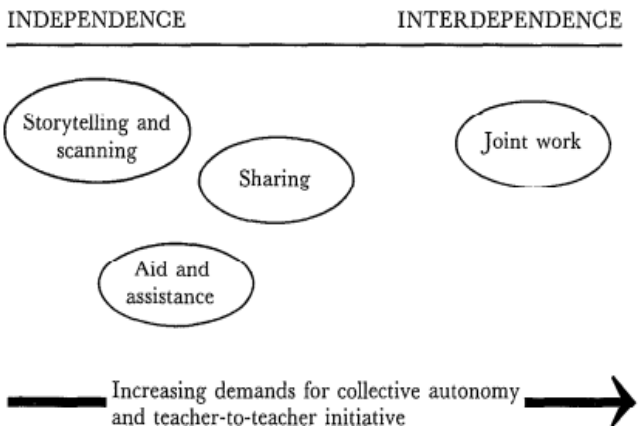

Figure 2.9 Little (1990) continuum of teacher collaboration.

Definition of a Team

Vangrieken, Dochy, Raes, and Kyndt (2015), conceptualized team as a distinguishable collection of individuals, who identify themselves as a team to reach specific shared goals for which they share responsibility and hold themselves mutually accountable. Cohen and Bailey (1997) described teams as a "collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems, and who manage their relationships across organizational boundaries" (p. 242). Similarly, Hackman (1990) proposed five critical characteristics of a team as:

a. Teams exist to achieve a shared goal.

b. Team members are interdependent regarding some common goals.

c. Teams are bounded and stable over time.

d. Team members have the authority to manage their work and internal processes.

e. Teams operate in a social system context.

Additionally, in some literature, the term team or group is used interchangeably to describe a collection of two or more individuals. However, according to Hackman (1990), the two terms are distinct. In a group, members work on a common goal, whereas in a team, members are fully committed to the common goal and strategies they have developed to reach that goal. This gives vision and motivation for the members of the team to succeed in achieving the goal. Members of a group tend to be accountable to a manager or higher official. On the contrary, in a team, members are mutually accountable to each other.

In a team, members tend to take roles and responsibilities due to their commitment to the team. Lastly, team members tend to show a higher level of trust and collaboration among members than do groups. Groups tend to lack a shared culture of collaboration; hence even though a group may accomplish a task, work of a team is synergetic, where team members achieve more than everyone could on their own (Cohen & Bailey, 1997; Thompson, Aranda, Robbins, & Swenson, 2000). Using the definition of a team (as opposed to a group), the TBT model (Ohio Department of Education, 2015b) envisions teachers to be engaging in deeper levels of formal and focused collaboration, rather than participating as groups that are superficial, informal and loosely related in their purpose.

Types of Teams in Schools

Even within the umbrella of the term teacher-based teams, schools use a myriad of characteristics to describe the actions or collaborative practices of teachers in such teams (Westheimer, 2008). Noticing the lack of clarity concerning the definition of the term TBTs, and the paucity of literature discussing TBTs, Vangrieken et al. (2015) further operationalized these concepts. They described teacher teams based on the type of task, discipline level, grade level, a temporal duration, and entitativity (Figure 2.8).

According to Vangrieken et al. (2013), teacher teams are assigned a multitude of tasks that can broadly be classified as governance or management, instruction, pedagogy, special or social services, innovation, and school reforms, and learning teams. To this end, based on tasks, teacher collaboration in TBT's represent learning teams that focus on the personal learning and growth of teachers as it pertains to pedagogy and instruction.

In addition to the task assigned to the team, another way to describe teams is based on the configuration of the team. Using this criterion, the team can be described as comprising of content area or grade level teachers. However, in elementary schools like those used in the current study, the same teacher can teach all core subjects, so the teams tend to be interdisciplinary.

Temporal duration or longevity of a team is another way to categorize teams. In this dimension, teams can be ad- hoc, short-term, or long-term. Though the time duration of a team is subjective, the TBT framework mandates that during the academic year a TBT meet at least 40 minutes a week (160 minutes per month). The long-term temporal duration further adds to the formal nature and structure to teacher collaboration.

Lastly, teams can be described based on team cohesiveness or entitativity. Team entitativity is defined as the degree to which a collection of individuals possesses the quality of being a team or a unit. Vangrieken et al. (2015, 2016) applied this idea to teacher teams and proposed that to increase a team's entitativity or cohesiveness; the teacher team needs to possess shared goals, responsibilities, and commitment, the degree of identification, task interdependence, and outcome interdependence. Recall that Hackman (1990) also distinguished a team from a group by focusing on shared commitment, goals, and identification orientation of teams. Teacher collaboration as envisioned in TBTs includes roles, responsibilities, norms, and specific steps thereby adding more entitativity to the team and strengthening teacher collaboration.

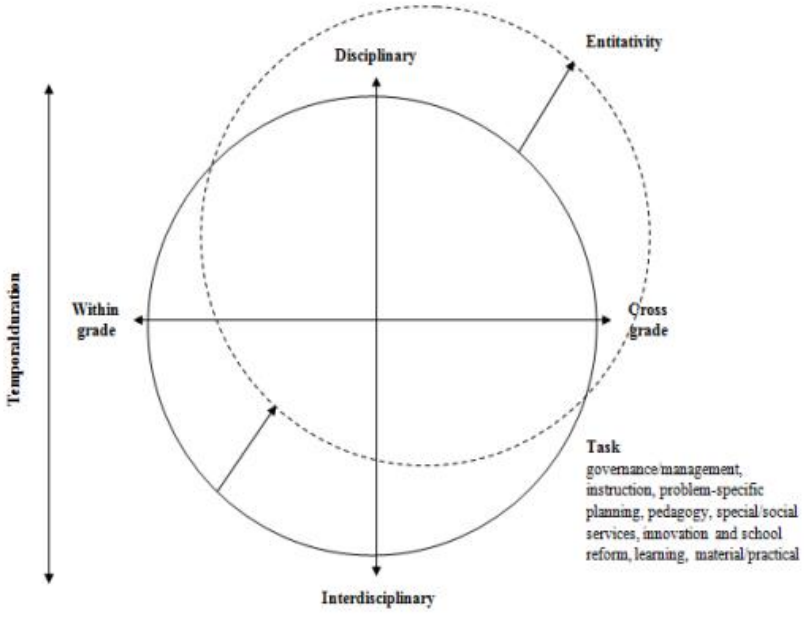

Figure 2.10 Vangrieken (2016) typology of teacher teams.

Stages of Team Development

Since the mid-1960s, the development of groups or teams has been generally understood as evolving through distinct stages of forming, storming, norming, and performing (Figure 2.9) (Ohio Leadership Advisory Council, 2013; Righter, 2017; Tuckman, 1965). At the forming stage, team members are uncertain about the purpose, structure, and goals of the team. Hence, members tend to be polite, impersonal and guarded. At this stage, members are also "testing the waters" to gauge the limits of acceptable behavior. The storming stage is characterized by an intra-team conflict where members start to have conflicts, confrontations, difficulties, feelings of opting out, and feelings of frustration. Additionally, it is in this same stage that members have accepted the formation of the team, but there is resistance to the constraints that the team imposes on individuals.

From the abyss of the cathartic stage of storming, the team rises through the stage of norming when the team starts to get organized, adds structure, sets norms, develops routines, and follows procedures. This is also the stage when the team starts to develop close relationships and cohesiveness. The final stage of team development- performing, encapsulates the fully functional synergistic stage of a team. During this stage, the team becomes open, resourceful, effective, and supportive of its members and their endeavors.

Figure 2.11 Tuckman's team and group development model (Tuckman, 1965).

Tuckman's team and group development model can be used when viewing the dynamics of the Teacher Based Teams. The forming stage occurs when the Building Leadership Team (BLT) assigns individual teachers to TBTs within the school. This is also the stage when teachers start to meet at a specific time and location thereby adding formal nature and structure to teacher collaboration. During the storming stage, conflict starts to appear in a team. This can occur when teachers are expected to share their data or practices with the TBT and can expose the teacher and his/her practices to the team and open avenues for criticism. Conflict can also be due to a few team members forming their niche in the team, thereby making other team members feel like outsiders. Though norming is built into the OIP framework as roles, responsibilities, and norms, social norms can also be informal, especially in a social setting like TBTs. Lastly, the performing stage takes place when teachers implement the decisions regarding instruction as determined by the TBTs and also bring student work to share instructional practices.

Collaborative Inquiry as a Framework of Teacher Based Teams

The 5-step iterative process (Lloyd et al., 2014; Ohio Department of Education, 2015b) that TBTs employ can be summarized as:

1. collect and chart data,
2. analyze data,
3. establish shared expectations for implementing specific changes
4. implement changes consistently,
5. collect, chart, and analyze post data.

While collaboration is inherent in the 5-step TBT process, the actions taken in the 5-step process by these teams can be described as engaging in collaborative inquiry. Collaborative inquiry is defined as a process in which teachers come together to review their practice of teaching systematically. Quintana et al. (2004) defined inquiry as a "process of posing questions and investigating them with empirical data" (p. 375). During the collaborative inquiry, teachers work in unison to analyze their classroom data and improve their teaching practices. The type of data that teachers analyze in such groups is essential, as the research has shown that if the data are not timely or are focused on student achievement, the level of teacher inquiry is superficial. On the other hand, when the data used are timely and are gathered from the classroom assessment or activities, the level of teacher implementation of inquiry is deeper and reflective (Marsh et al. , 2006).

Much like to 5-step process in TBTs, Goodnough's (2005), characteristics of collaborative inquiry in teams include involving small teams of teachers that are working together to address a common problem of practice and moving the team through the

cyclical five-step inquiry process (Goodnough, 2005; Bray et al. 2000) that involves planning, reflecting and acting (Figure 2.10). Through this inquiry process, educators develop a deeper understanding of their practice. According to Bray (2000), the heart of the collaborative inquiry model is a cyclical process of inquiry that involves framing the problem, collecting evidence, analyzing the evidence, and documenting, sharing, evaluating, and celebrating results. In this regard, the Bray model of collaborative inquiry is like the 5-step process used by TBTs as part of the OIP. Both models seek to make meaning of data and to use collaboration to facilitate instructional improvement. Additionally, the cyclical nature of collaborative inquiry offers structure, formal nature, and a deep focus on instruction for teacher collaboration.

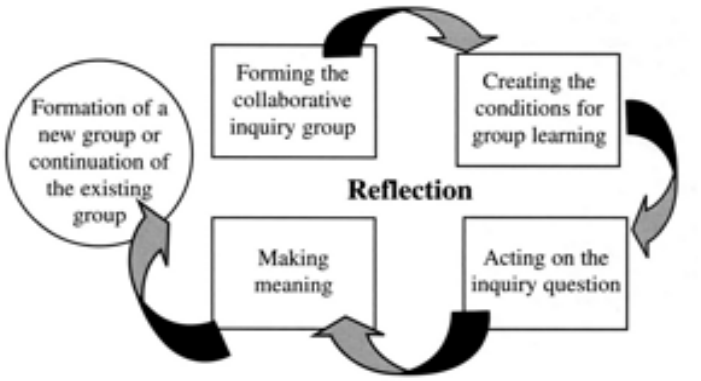

Figure 2.12 Bray (2000) five stages collaborative inquiry model.

Advantages of Teacher Collaboration

Irrespective of the framework used to implement teacher collaboration; research shows that teacher collaboration when implemented properly has benefits for all three levels of school organization (student, teacher, and school). At the student level, the positive benefits of teacher collaboration can be observed in the improvement of student understanding, increase in student learning, performance, and success (e.g., Egodawatte et al. 2011; Goddard et al., 2007; Lomos et al., 2011; Westheimer, 2008).

Goddard et al. (2007) used hierarchical linear modeling (HLM) to explore the relationship between teacher collaboration and student achievement. This study found that after controlling for a child's social, academic background, and school's context, a one standard deviation increases in teacher's level of collaboration, predicted about 0.1 standard deviation increase in differences among schools in student achievement (as measured by Mathematics and Reading Assessments). Goddard et al. (2007) aggregated teacher-level collaboration scores at the school-level, thereby treating it as a school-level phenomenon and not teacher-level. The collaboration items used in the study focused on collective planning for school improvement, selecting instructional methods and activities, developing professional development goals, and activities, and evaluating curriculum.

Later, Goddard et al. (2015) proposed a pathway that linked teacher collaboration, instructional leadership, and student achievement. Using structural equation modeling, the authors proposed a significant direct effect of principal's instructional leadership on teacher collaboration and a significant indirect effect on student achievement mediated by

teacher collaboration. Stated otherwise, when principals are involved in instructional decision making of a school, the principals will provide teachers with time, resources, and support for such instruction focused and data-driven collaborative activities. Such collaborative activities help to increase teacher efficacy by building on teachers' knowledge and skills. This study also aggregated the teachers' responses to collaboration at the school-level, thereby eliminating the variation in teacher collaboration within the school. Interestingly in this study, Goddard et al. (2015), expanded on the previously used 5-item collaboration scale to propose a more detailed 13-item teacher collaboration scale that considered three dimensions of teacher collaboration: formal collaboration, the frequency of collaboration on instruction and teacher collaboration on instructional policy. The scale reflects the changing times where collaboration has become formal and focused on instruction.

It has also been reported that collaboration that focuses on analyzing and using student data to guide practice and collaboration that focuses on curriculum, assessment, and instruction tends to improve student learning (Kelchtermans, 2006; Pounder, 1998; Vangrieken et al., 2015). Strahan (2003), studied the professional culture of three high achieving elementary schools and observed that teachers in these schools indulged in "data directed dialogues" where they use both quantitative data and qualitative data (in the form of observations) to identify and cater to individual student's pedagogical needs. Likewise, Vescio et al. (2008), observed that effective professional learning communities (PLCs) also had a stronger focus on data use to make instructional decisions.

More recently, Saunders, Goldenberg, and Gallimore (2009) used a quasi-experimental design to study the effects of grade level teams on student achievement. The teams described in their study had a structured framework of the team and meetings much like the TBTs proposed in the Ohio Improvement Process (OIP). The authors found that collaborative efforts that resulted in gains in student achievement were structured, frequent, focused on student learning needs, driven by inquiry, and facilitated by trained members of the instructional team.

Using previously described frameworks, when teacher collaboration is studied at the teacher-level, it has resulted in greater efficiency, increased communication, increased teacher effectiveness, improvement in teacher motivation and morale, greater teacher collegiality and efficacy, a reduction in teacher isolation, increased student-centered conversations, and improved awareness of research and data-based practices (e.g. Egodawatte et al., 2011; Main, 2012; Moolenaar et al., 2011; Slavit et al., 2011; Westheimer, 2008). The literature is scant on the effects of increased teacher collaboration at the institutional or school-level. The existing research shows that increased levels of teacher collaboration positively influences perceptions that school climate is conducive for innovation, values democratic processes and equity, places attention on the needs of all students, has shared leadership structure, and promotes a culture of intellectual inquiry (e.g., Moolenaar et al., 2011; Slavit et al., 2011; Westheimer, 2008). The last section of this chapter will highlight some studies that have reported the association of teacher collaboration with teacher efficacy and school academic press.

Drawbacks of Teacher Collaboration

Though collaboration might seem a panacea for all problems, conflicts and stress can mar smooth operations of the teams, and the egg crate structure of schools offers few opportunities for meaningful collaboration. Therefore, not all teacher collaborations are considered positive. Most of the adverse and negative consequences of teacher collaboration are reported at the teacher-level namely: a loss of autonomy, increase in competitiveness, higher workload, more time commitment, increase in tension among teachers and an increase in levels of conformity (e.g., Bovbjerg, 2006; Gunn & King, 2003; Johnson, 2003).

Achinstein (2002) utilized the lens of organizational theory to understand the pitfalls of teacher collaboration better and proposed that collaboration, and consensus are critical elements for building a community. However, they can also generate conflict. How the teacher team handles the conflict, negotiates borders, and defines ideological differences in the team will decide the longevity and depth of work that the team can accomplish. According to Achinstein (2002) conflict can be an event where either the individual or team clashes and exposes the differences or divergent views that exist in the team. To deal with the conflict, the team can either exclude or transfer conflict (avoidant stance to conflict) or the team can acknowledge conflict by reflecting on the diversity of opinions (embracing stance to conflict).

Teams also respond to conflict by defining ‘borders’ or inclusivity of the team concerning the types of members that are allowed in the team. On the continuum of border politics, the exclusive border politics represent the teams that have highly bonded

social ties and homogeneity within the team. In such teams, rigid or impermeable barriers prevent outsiders and represent an “us” and “them” attitude (Achinstein, 2002). Alternatively, inclusive border politics represent stances where individual and subgroup identities are upheld, and diversity of opinions and ideas is fostered. This inclusive team tends to have open boundaries that are inclusive of all members of the school.

As a member of the team, the individual wants to be accepted by the team members and susceptible to conforming to team norms. There is considerable evidence that groups can place substantial pressure on individual members to change their attitudes and behavior to conform to the group norms (Ostovar-Nameghi & Sheikhahmadi, 2016). The individual members conform to avoid facing the consequences by being visibly different (Achinstein, 2002). This view of the normative press of a team parallels group norms and sanctions proposed by Coleman (1970) and Goddard et al. (2004).

At the group or team level, collaboration has been shown to promote groupthink, convergent thinking, social loafing, balkanization, and the emergence of hierarchies (e.g., Bovbjerg, 2006; Gunn et al., 2003; Scribner et al., 2007). The closed structure of the team can lead to the isolation of the team also called Balkanization. This may lead to exclusivity where teachers rarely know about or interact with other teachers that are not in the team (Bovbjerg, 2006; Main, 2007). Furthermore, in teams sometimes a phenomenon known as social loafing is observed. Social loafing is the tendency of individuals to spend less effort when working collectively than when working individually. Social loafing can be attributed to the belief that other teachers in the team

are not doing their fair share. In response to this belief, the individual feels less motivated to do his or her best.

Furthermore, social loafing can also be due to the dispersion of responsibility. As the results of teamwork are collective, individuals can feel tempted to work less as no one individual is responsible for the outcome. Social loafing in a team represents the negative synergy: in which the whole is less than the sum of the parts.

Groupthink is a phenomenon that is related to the norms of the team. It describes situations in which team pressures for concurrence deter the team members from sharing and critically analyzing minority or unpopular views. In such scenarios, team members that hold the minority opinion feel under pressure to suppress, withhold, or change their true feelings to avoid disruption and to suit the needs of the group (Vangrieken et al., 2013; Voogt et al., 2016). Group thinking tends to be prevalent in groups that have a definite group identity, where members want to portray and protect a positive image of the group. One way to minimize the effects of groupthink on a team is to have a manageable size of the team, as members tend to get more intimidated and hesitant in large groups. Also, the team facilitator or the leader should seek input from every member and also appoint a member whose duty is to challenge the majority decision and offer a divergent view (Scribner et al., 2007).

In sum, collaboration can also function as a control mechanism where the rigid structure of the team encourages conformity and discourages teacher autonomy. In this case, the whole becomes more important than the various members that contribute to the team. Because of this, individual contributions can be lost when met with the force of the

larger group. Furthermore, collaboration also encourages standardized performance expectations (Scribner et al., 2007). Again, the individual loses their uniqueness for the sake of the larger group, therefore in some ways, weakening the ability of a team.

Factors that Facilitate Effective Teacher Collaboration

Recent research has started to document the stressful effects of formal collaboration on teachers (Gray et al., 2016) and propose factors that can influence effective teacher collaboration (Berry, Daughtrey, & Wieder, 2009). Head (2009) proposed that collaboration works at two levels: the functional level, also called functional or bounded collaboration, and at a deeper level, called effective collaboration. In functional collaboration, individuals collaborate at a superficial level where they may be working in groups or teams but behave as individuals and merely carry out the roles expected for them (Hargreaves, 2001). However, in the effective collaboration, the work of a group or a team not only caters to individual interests but also leads to success that can only be achieved by team members working together. This success is achieved by creating shared knowledge and understanding of the team. Stated otherwise, in the effective collaboration, the final product is greater than the sum of the parts. As previously mentioned, this effective collaboration tends to have a synergistic effect.

The locus of collaboration lies in the teacher's ability, attitude, and willingness to collaborate in a team (Main, 2007). A significant factor that has been shown to facilitate effective collaboration is the structural support provided to the team (R. D. Goddard et al., 2015; Head, 2009b; Ostovar-Nameghi & Sheikhahmadi, 2016). Specifically, the structure of the team- roles, goals, norms, and agenda offer robust support for the team to

work. Additionally, scheduled common planning time and a place for the team to meet and work together is imperative for an effective team (Flowers et al., 2000; Main, 2007; Meirink et al., 2010; Mertens & Flowers, 2004).

School characteristics that facilitate teacher collaboration include a school philosophy that supports student learning and teacher collaboration. Specifically, administrative support, transformational leadership, continuous professional development, school governance structure, school-wide instructional leadership, and good facilitation have been documented to be positively associated with effective collaboration among teachers (Fulton & Britton, 2011; Saunders et al., 2009; Truijen et al., 2013).

Darling-Hammond (1994) offered multiple characteristics of successful collaborations viz. clear focus, shared goals and decision making, mutual trust and respect, manageable agenda, commitment from leadership, Fiscal support, and information sharing and communication. Darling-Hammond (1994, 2009) postulated that professional development activities that focus on student learning and help teachers in developing pedagogical knowledge have a substantial impact on altering a teacher's teaching practices. Activities that emphasize collaboration, collegiality, active teaching, involve reflection, are frequent and structured, focus on data and instructional practices, and are job-embedded tend to alter teaching practices. On the contrary, activities that are episodic and disjointed, unrelated to the teacher's content or curriculum, and expect teachers to make changes in isolation do not support teacher learning. Darling-Hammond (2009) cautions against such 'one-shot workshop models.'

A recent report by the Ohio Education Research Center (Munn & Lindsey, 2017) evaluated the impact of the Ohio Improvement Process (OIP) and observed that factors which contribute to OIP successes include additional resources for personnel, as well as professional development and external supports like academic coaches. However, schools that struggled to implement the OIP reported resistance to the OIP as yet another failed attempt to transform schools. Other factors such as high principal turnover, student mobility, poor student attendance, and teacher inability to translate data to actionable instructional strategies were identified as limiting factors. Presently, OIP functions as a robust framework to be used by schools planning to improve pedagogy, especially schools that are struggling to reach state-mandated standards. In this regard, the locus of the success of the school improvement process rests on teachers meeting in teams and working collaboratively to identify, implement, and evaluate instructional practices that suit the needs of the students.

Studies Linking Teacher Efficacy, Teacher Collaboration, and Academic Press

Though this is the first attempt to study the relationship between the three variables specifically in urban schools, past researchers have looked at a few permutations between the three variables at different levels. For example, one of the first studies to document the association between teacher efficacy and school academic press was by Hoy and Woolfolk (1993). Since then, one can find a gamut of studies linking two of the three variables. The studies selected for this section share some common themes: the studies tended to use teacher efficacy scale used by Goddard and Goddard (2001), or the studies had clearly defined the school environment or climate as academic emphasis

or academic press, or the studies had teacher collaboration that is structured and focused on instruction.

Hoy and Woolfolk (1993) studied the relationship between teacher efficacy and school's climate using a sample of elementary school teachers teaching in districts that were above average in wealth. In the study, they considered both personal and general teaching efficacy and school's climate consisted of six dimensions, one being the school academic press. Notably, since they were concerned with individual relationships between efficacy and perceptions of school health, each subject responded to the efficacy and school health instrument, thus "the measures of school health and efficacy were not completely independent" (p. 369), and academic emphasis was not aggregated at the school level, so it represented individual teachers perception of school academic press (teacher-level variable). They reported a positive significant association between personal teacher efficacy and teacher perceptions of academic emphasis (r (177) = .23, $p < .01$), and personal teacher efficacy and educational level (r (173) = .21, $p < .01$). Using hierarchical multiple regression analysis, they showed that academic emphasis has a positive association with personal teaching efficacy ($\beta = .19$, $p < .05$) and that the organizational and personal variables explained 12% of personal efficacy variance.

Acknowledging the gap in the literature, Chong et al. (2010) examined the relationship between teacher efficacy beliefs and the school's academic climate using middle school teachers from Singapore. They conceptualized the academic climate of the school as academic press (Sweetland & Hoy, 2000) and used Hoy et al.'s (2001) teacher and collective efficacy scales. They concluded that collective teacher efficacy had a

mediating influence on teacher efficacy and academic climate ($\beta = .45$, $p < .001$) and that schools characterized by high levels of teacher and collective efficacy and academic climate are better positioned to communicate press for effective pedagogy that produces positive outcomes. However, the study failed to consider how teacher efficacy and academic climate vary between schools and classrooms as a function of other school or teacher-level variables.

More recently, Pas et al. (2012) employed longitudinal multilevel modeling to examine the influence of teacher-level and school-level variables on teacher efficacy. Using a sample of 600 teachers from 31 elementary schools and well-established scales of school health (Hoy & Feldman, 1999), and teacher efficacy (Goddard & Goddard, 2001; Hoy & Woolfolk, 1993), Pas et al. aggregated teacher-level responses to create a school-level health inventory rating that was not significantly associated with teacher efficacy ($\beta = .16$, $p > .05$). They reported a significant and positive relationship between teacher's perception of academic emphasis (teacher-level) and teacher efficacy ($\beta = .21$, $p < .01$). The final proposed model showed significant, positive associations between teacher preparedness, collegial leadership, academic press (all teacher-level) with teacher efficacy and none of the school-level predictors (school enrollment, mobility, and suspension rate) were consistently significantly associated with teacher efficacy. The final model reduced intraclass correlation (ICC) by 23.0 % and reduced between-school variance in teacher efficacy by 39.5%. Pas et al.'s handling of academic press scale can be concerning as they constructed the school academic press scale using teacher-level

items whose statements can be described as self-referent beliefs. Such modifications can be confusing and may also lead to erroneous conclusions (Goddard & LoGerfo, 2007).

Some researchers have also treated collaboration as a dimension of school climate (Bryk et al., 2010; Collie et al., 2012; Lee & Shute, 2010) and studied its relationship with teacher efficacy Using a sample of 664 teachers from suburban and rural Canada, Collie et al. (2012), investigated whether teachers' perception of school climate influenced teacher efficacy, teacher stress, and job satisfaction. To measure teacher efficacy, they summed the scores of personal and general teaching efficacy scales proposed by Tschannen Moran et al. (2001) and for school climate they used a 17-item scale that encompassed four dimensions of school climate: collaboration, student relations, school resources, and decision making. The Collaboration dimension of school climate consisted of three items (e.g., I have regular opportunities to work with other teachers, teacher design instructional programs together). Additionally, though the authors described collaboration variable as a school climate construct, they failed to aggregate the scores to school-level or use multilevel methods to account for the nesting nature of the data. Using structural equation modeling, they proposed that teacher's level of collaboration ($\beta = .09$, $p = .047$), students' behavior and motivation ($\beta = .13$, $p = .013$) and teacher comfort in implementing social-emotional learning ($\beta = .34$, $p < .001$) were positively and significantly related to teacher's efficacy beliefs. Also, the model with these three predictors explained 38% of the variance in teacher efficacy.

Interestingly in this study, they also reported that teacher-level of collaboration was positively associated with stress ($\beta = .35$, $p < .001$). The authors concluded that work

intensification due to more meetings and workload as a result of collaboration could increase the level of stress reported by teachers. These results are similar to the drawbacks of teacher collaboration discussed previously in this chapter.

Gray et al. (2016), used a sample of teachers from low-income schools in the United States to test if academic emphasis (AE), enabling structure (ES), and collegial trust (CT) serve as antecedents of teacher collaboration in professional learning communities (PLC, another model of teacher collaboration, much similar to TBTs). They used a modified version of the Professional Learning Community Assessment (PLAC) instrument. Sample items included, 'leadership is promoted and nurtured among staff members,' 'professional development focuses on teaching and learning,' and 'opportunities exist for coaching and mentoring.' Academic emphasis was measured by the eight-item Organizational health index (OHI) (Hoy et al. 1991). Data were collected from about 3700 teachers and 190 principals from 67 schools that had implemented the PLC model of teacher collaboration and scores for all variables were aggregated at the school level. In other words, they considered teacher collaboration in PLC's as a school-level and not teacher-level variable. The study also failed to account for any multicollinearity issues that could have arisen due to the high correlation between academic emphasis and collegial trust (r (65) = .65, p < .01). They reported that development of professional learning communities was positively and significantly related with enabling school structures (r (65) = .73, p < .01), academic emphasis (r (65) = .65, p < .01) and collegial trust (r (65) = .57, p < .01).

Gray et al (2016), regressed dependent variable (PLC) on three independent variables (AE, CT, ES, school-level and SES) and reported that professional learning communities were positively and significantly affected by enabling structures ($\beta = .54$, $p < .01$) and academic emphasis ($\beta = .32$, $p < .01$). Together enabling structures and academic emphasis explained 69% of the variance in PLC development. The authors concluded "development of PLCs that foster increased collaboration and in turn, attention to student learning outcomes rests on a school leader's ability to foster these conditions and factors," conditions and factors being enabling structures and academic emphasis. Notably, Goddard et al. (2014, 2015) also reached similar conclusions about the role of strong leadership to create structures that facilitate teacher collaboration that in turn contribute to the strengthening of collective efficacy beliefs.

Ibrahim, Sedat, and Mehmet (2013) investigated whether professional collaboration (and principal leadership) predict teacher efficacy. Using data from Teaching and Learning International Survey (TALIS) of about 3,000 teachers from 178 middle schools in Turkey, they utilized multilevel modeling to investigate whether teacher collaboration (and principal leadership) explain variation in teacher efficacy. An Intraclass correlation (ICC) of 8% was obtained from the unconditional model. In the full model containing various teacher and school-level variables, Ibrahim et al. (2013) reported that teacher professional collaboration was the strongest predictor of teacher efficacy ($\beta = .37$, $p < .01$) and teacher experience had a small but significant influence on teacher efficacy ($\beta = .07$, $p < .01$). Though the paper reported that teacher collaboration explained variation for teacher efficacy, the authors failed to report any values for within

and between-school variance for the full model, thereby rendering percent variance change calculations impossible.

Sehgal et al. (2017) explored the role of teacher collaboration and principal leadership in explaining the relationship between teacher efficacy and teacher effectiveness. They utilized a teacher efficacy scale proposed by Tschannen-Moran et al. (2001) and a teacher collaboration scale developed by Goddard et al. (2007). The 5-item teacher collaboration scale had items like "To what extent do teachers work collectively to influence planning school improvement, selecting instructional methods and activities" (p 893). Using structural equational modeling on data of 575 secondary school teachers from 25 private schools in India, they reported that collaboration among teachers is positively related to teacher efficacy ($\beta = .26$, $p < .001$). In keeping with some previous studies, none of the teacher demographic variables (age, qualification, and experience) were significantly related to teacher efficacy.

More recently, Goddard and Kim (2018), explored if teachers reported the use of differential instruction mediates the relationship between teacher perception of collaboration and teacher efficacy. On a sample of teachers from rural high poverty schools, Goddard et al. (2018) employed the often used four-item teacher efficacy scale (Goddard & Goddard, 2001) to measure teacher efficacy and a 13-item teacher collaboration scale measuring teacher collaboration on instructional policy, formal collaboration, and informal collaboration.

Items on the scale focused collaboration for instruction and collaboration that occurs frequently and is periodic, more like the teacher collaboration (in TBTs) in the

current study. Though a small ICC (3%) was observed, Goddard et al. (2018) rightly used multilevel structural equation modeling to account for nesting and reported a significant direct relationship between the three subconstructs of teachers' collaboration and teacher efficacy (ranging from .22 to .25). In this study a small, significant indirect effect between teacher collaboration and teacher efficacy (β = .16, p < .001) and small significant relationship between teacher efficacy and years of experience (β = .04, p < .10) was reported. The authors concluded that the mastery experience gained through teacher collaboration focused on differentiated instruction also strengthened teacher efficacy beliefs. In addition, they also reported significant and negative relationship between percent students with free lunch (school-level variable) and teacher efficacy (β = -.81, p < .01) and between total enrollment (school-level variable) and teacher efficacy (β = -.34, p < .05).

Chapter 3. Methods

Introduction

This chapter describes the methodology used to test the hypothesis of this study. After stating the research questions and hypotheses, this chapter provides details of the instrument used, sampling procedure and field-testing of items. The penultimate part of the chapter elaborates on each variable and items used for that variable, and finally, a rationale and details of statistical analyses: factor analysis and hierarchical linear modeling are provided.

Research Questions

The purpose of this study is to investigate whether there is a significant variation in teacher efficacy within and between schools and if teacher collaboration and school academic press account for this variation in teacher's efficacy scores. Specifically, this study addressed the following sub-questions:

1. Does teacher efficacy vary within and between schools?
2. After controlling for teacher-level demographic variables (age, gender, level of education, total teaching experience and teaching experience at current school), if teacher efficacy still varies within schools, does teacher collaboration account for this variation?

3. After controlling for school-level contextual variables (average SES, prior achievement, percent students that are mobile or minority or gifted), if teacher efficacy still varies across schools, does school academic press account for this variation?

Hypothesis

As the variables of the study represent different units of analysis (teacher and school), hierarchical linear modeling (HLM) was employed to test the following hypotheses:

H1. Teacher Efficacy varies significantly within and between schools.

H2. After controlling for teacher-level demographic variables, teacher collaboration is a positive and significant predictor of variation in teacher efficacy.

H3. After controlling for school-level contextual variables, school academic press is a positive and significant predictor of variation in teacher efficacy.

Sample for the Study

The data for this study were obtained from a survey of teachers in a large Midwestern urban school district. Both, traditional and charter elementary schools (K-5) from this school district participated in the study. In January 2016, doctoral researchers contacted the school district about the study and recruitment of participants. Upon approval, school administrators were contacted about the study and the schools that agreed to participate were given the survey by doctoral researchers during regularly scheduled staff meetings. All effort was made to maintain teacher anonymity and confidentiality. For participation in the survey, the school was given a gift card and a

school report of survey results.

The survey had two forms: Form A and Form B. Form A had five items about teacher collaboration, and Form B had nine items addressing academic press. Both forms had four items to measure teacher efficacy. Furthermore, during the survey, all effort was made to randomly assign a teacher either Form A or Form B. A convenient final sample of 400 teachers in 53 elementary schools responded to Form A, and 346 teachers from 51 schools responded to Form B. Both forms had variables that represented the demographic information about the teachers. The school district provided school-level contextual data, namely, percent students that received free and reduced lunch (a proxy for socioeconomic status), gender, minority status, gifted status, and academic achievement for grades 3, 4, and 5 over the last three years.

Instrumentation

In 2015, a group of doctoral students at The Ohio State University, under the aegis of a faculty member from the Department of Education Administration, developed a survey instrument for use with urban teachers to assess various school and teacher-level constructs. For example, items in the survey pertained to instructional leadership, grit, teacher expectations, teacher efficacy, collective efficacy, academic press, and teacher collaboration. The final survey had two forms, A and B. The following sections describe the item construction and selection process. Notably, the items pertaining to school academic press were written by the author whereas items about teacher collaboration were written by Righter (2017) and teacher efficacy by Goddard and Goddard (2001).

Cognitive Interviews and Field Test of Academic Press Scale

Before field-testing the instrument with a sample of teachers, the instrument was reviewed by a panel of researchers. This panel included both an experienced educational leadership researcher and a professor of educational administration. The review panel analyzed the instrument for the format, style, clarity, grammar, and syntax usage. The preliminary instrument was field tested by five teachers enrolled in graduate-level classes at The Ohio State University. Teachers included in this field test were from public elementary and secondary schools that were taking graduate-level classes during the summer of 2015.

Cognitive interview method (Ericsson & Simon, 1980) is a research method used to pretest a survey instrument to evaluate if the instrument is measuring what it intends to measure. Besides, it is a helpful method to analyze the wording and identify the sources of error in the survey instrument. Cognitive interview method focuses on cognitive processes a respondent uses to answer the survey items. The process of answering a question consists of four steps:

1. comprehension of the question;
2. retrieval of information to answer the question;
3. a judgment of the intended answer; and
4. respond to the question.

As it is not possible for the interviewer to merely observe the respondents' thought process as they answer a question, an interviewer uses probing questions

prompting the respondent to verbalize their cognitive/thinking process. By doing so, it decreases the subjectivity of the researcher in interpreting the respondents' answers.

There are two accepted techniques associated with the cognitive interviewing method: think-aloud and verbal probing. In the think-aloud technique, the respondent is asked to verbalize their thought process. The interviewer stays passive, to reduce the bias of the interviewer. Additionally, the open-ended design of this method helps analyze patterns in the responses. In the verbal probing method, additional specific probing questions are asked of the respondents after they have provided an initial response (Köhnken, Milne, Memon, & Bull, 1999).

For this study think-aloud technique was used in cognitive interviews and respondents were asked to provide feedback about specific questions that were ambiguous or confusing. Respondents were asked to think-aloud as they answered the questions to assist the researcher in understanding how the respondent understood and interpreted the questions. Results from cognitive interviews and focus group showed that for most items, the respondents interpreted the survey items as intended by the researcher.

For analyzing specific problems with each item, the responses of the cognitive interview were coded using the scheme developed by Conrad and Blair (1996). According to this coding scheme, the main types of problems in an item are lexical, logical, temporal and computational. Lexical issues in an item is related to the issue of words and their commonly interpreted meaning and usage; logical confusion in an item tends to arise from using connecting words like 'and', 'or' as these words can make

respondent answer both questions in one item; temporal confusion in an item can stem from differing interpretation of time (last year can mean last academic year, last calendar year or last 12 months); and lastly, in time referent items where a respondent is asked to calculate or recall like, 'how many times in last six months' may suffer from computational glitches.

Using Conrad and Blair's (1996) coding scheme, responses for every survey item were analyzed for lexical, logical or temporal anomalies. One problem item was flagged from these cognitive interviews. Specifically, item: "In this school classroom disruptions are infrequent" had some teachers concerned. Two respondents were unclear about the word *infrequent* in the first item, as one of them said that infrequent could be once a period, once a day, or week (lexical and logical infirmity in the item). Hence, reframing the item to show the frequency may reduce this concern: "Over the last one week, how many times was your classroom disrupted," but rewriting the item can introduce computational problems. Moreover, this was not possible due to the nature and constraints of the survey where all items were on a Likert or nominal scale.

After cognitive interviews, during the autumn of 2015, the items were field-tested using a sample of educators who were taking classes at a large Midwestern university. The respondents were practitioners in both independently governed and locally governed schools. Although the sample was one of geographic convenience to the researcher, the sample choice aimed to capture a varied range of school-levels, levels of educational attainment, incomes, ages, and other demographic variables. Unfortunately, despite various contacts, only 22 participants completed the survey. It is recommended that for

Exploratory Factor Analysis, the researcher select at least ten respondents for each item (Tabachnick & Fidell, 2007). With the tiny sample size, any factor analysis should be analyzed and interpreted with caution.

Academic Press

Academic Press (AP) of the school was measured using nine statements that teachers rated using a Likert scale. These statements were:

1. This school has high expectations for student academic achievement.
2. In this school classroom disruptions are infrequent.
3. This school holds teachers accountable for academic success of students.
4. Teachers at this school support each other to improve student academic achievement.
5. This school responds immediately to disruptions of academic time.
6. Teachers at this school frequently assign homework.
7. Teachers at this school provide timely feedback on homework.
8. Exemplar student work is visible in this school.
9. In this school students are promoted only when they master content.

The nine-items used to measure a school academic press used statements that reflected the type of items that have been used in similar instruments that measured academic press (Alig-Mielcarek, 2003; Eubanks, 2012; Hoy, Sweetland, & Smith, 2002; Kirby & DiPaola, 2011; Mitchell et al., 2015; Shouse, 1996). The items addressed three commonly used dimensions of the academic press:

Orderly learning environment (items 2 and 5)

Rigor and mastery of content (items 6, 7, 8, and 9)

High Expectations and Accountability for all (items 1, 3, and 4)

After reading the statements, the teachers rated the accuracy of the statements with a 6-point Likert scale where 1 indicated that the respondent *strongly disagrees* and 6 indicated that the respondent *strongly agrees* with the statement.

The statements of the items reflect individual perceptions of group-referent capability (Goddard et al., 2004; Goddard & LoGerfo, 2007). Group referent items tend to use words like "teachers in this school," or "we," or "this school" (Goddard et al., 2004; Goddard, Sweetland, et al., 2000). Use of collective words makes group referent items distinct from self-referent items that tend to use "I," or "my" to show personal perceptions (Goddard et al., 2004). As is evident from the statements of academic press scale items, they reflect teacher's perceptions of the school. Thus, academic press here represents a school-level variable and accordingly teacher responses to academic press were aggregated to the school level. Empirically the aggregation of academic press can be justified with a statistically significant intraclass correlation (ICC). A significant chi-square value of ICC indicates that there exists a variation in outcome between schools and a compelling need for conducting multilevel analysis (Raudenbush & Bryk, 2002).

Teacher Collaboration

Teacher collaboration was measured using a five-item collaborative practices scale developed and used by Righter (2017). Items on this scale reflect the type of collaborative tasks teachers in the midwestern state undertook in their respective teacher-based teams (TBTs) and mirrors the five-step TBT cycle that was widely implemented in

the state as a part of the school improvement process (SIP) (Ohio Department of Education, 2015b). Teacher collaboration was measured using the Likert scale comprising of the following five items:

1. All teachers on my team implement agreed upon instructional practices.

2. All teachers on my team bring student work back to the team for analysis.

3. My team designs lessons based on student strengths and weaknesses identified in the data

4. My teacher team analyzes common assessment results to determine instructional practices to implement.

5. My team analyzes common post-test results to determine which instructional strategies worked best.

Teachers evaluated the statements by using a 6-point Likert scale ranging from 1 to 6. These pre-coded responses included 1, that indicated the respondent *strongly disagrees*, to 6 that indicated the respondent *strongly agrees* with the statement. As statements of the items reflect individual perceptions of self-beliefs (Goddard et al., 2004; Goddard & LoGerfo, 2007), teacher scores were averaged across five items, and each teacher was assigned a mean teacher collaboration score.

Teacher Efficacy

Teacher Efficacy was measured using a four-item scale previously used by Goddard and Goddard (2001). The scale is based on Gibson and Dembo's (1984) teacher efficacy scale, and past research has shown that the items are reliable and converge to

give a one-factor solution (Hoy & Woolfolk, 1993). Items on this scale reflect personal teaching efficacy. The statements that teachers rated using a Likert scale included:

1. If a student did not learn content from a previous lesson, I am confident I would be able to increase his/her retention in the next lesson.

2. If a student in my class become disruptive or noisy, I feel confident that I can redirect him/her quickly.

3. If one of my students could not do a class assignment, I would be able to assess accurately whether the assignment was at the correct level of difficulty.

4. If I try really hard, I can get through to even most difficult or unmotivated students.

Teachers' evaluated these statements using a 6-point Likert scale ranging from 1 to 6. These pre-coded responses included 1, which indicated the respondent *strongly disagrees*, to 6 that indicated the respondent *strongly agrees*. Teachers' scores' were averaged across four items and every teacher was assigned the mean teacher efficacy score.

Teacher Demographic Variables

The teacher surveys had teachers respond to various demographic questions. The demographic variables used in this study were assigned the following codes:

1. Ranges in the total number of years of total teaching experience (0-3, 4-9, 10-16, 17-25, 26+ years)
2. Ranges in the years of teaching in the particular school building (0-3, 4-9, 10-16, 17-25, 26+ years)

3. Gender (Female, Male): female = 1, male = 0
4. Ethnicity (White, Black, Hispanic, Asian, Pacific Islander, American Indian/Native American, and two or more races): For analysis, the ethnicity values were decomposed as white = 1 and non-white = 0.
5. Educational Level (< BA, BA, MA, EdS, EdD/PhD)

School Contextual Variable

The school district provided the data for school-level contextual variables. The data used in this study were assigned codes as follows:

1. School type (charter = 1, traditional public school = 0)
2. Priority school status (yes = 1, no = 0)
3. Percent of students considered economically disadvantaged (in 2016), measured by percent of students receiving free and reduced lunch
4. Percent of minority (non-white) students (in 2016)
5. Percent of students mobile 2016 (mobility during the 2015-2016 school year)
6. Percent of students identified as gifted in 2016
7. Average fourth-grade math and reading achievement scores of schools in state assessments in 2015, was operationalized as Prior Math Achievement and was used as a school-level control variable.
8. Average fifth-grade math and reading math and reading achievement scores of schools in state assessments in 2015, was operationalized as Prior Reading Achievement and was used as a school-level control variable.

Factor Analysis

Factor analysis is a multivariate data reduction technique that is commonly used in social sciences to construct scales for measuring an underlying or latent variable and for reducing a large number of variables (or items) to a small manageable set of variables (also called factors) (Field, 2013; Tabachnick & Fidell, 2007). For example, a factor analysis of the nine-items of the proposed academic press scale can help to confirm if the items are measuring the same latent construct (or factor), the academic press. In factor analysis, the correlation matrix of the items (R-matrix) is analyzed to identify items that are associated with each other. The goal of the analysis is to explain the maximum amount of shared variance among the items using the smallest number of factors also known as reducing the dimensionality of items (Bartholomew, Knott, & Moustaki, 2011).

Factor Analysis can be divided into two broad categories: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is considered empirical or heuristic and is used as a tool in building a theory whereas CFA is more rigid and is used as a tool for testing a theory. CFA has assumptions and expectations based on priori theory about the number of factors, and which factors or models best fit the data (Tabachnick & Fidell, 2007), whereas EFA provides preliminary evidence of the factor quality and proceeds CFA. As the study undertaken is preliminary, EFA was performed on the items representing teacher efficacy, teacher collaboration, and academic press.

Typical steps in exploratory factor analysis are (Comrey & Lee, 2013; Kline, 2014; Kline, 2013; Yong & Pearce, 2013):

1. Selecting items for EFA
2. Screening data for normality, linearity, lack of multicollinearity and missing data
3. Taking a preliminary look at the correlation matrix to judge the factorability of the data
4. Choosing an appropriate method of extraction and rotation
5. Deciding how many factors to retain
6. Evaluating individual item performance and
7. Evaluating the adequacy of the factor solution.

The selection of items for EFA is based on the researcher's knowledge about past research on the construct and type of items that have been used in the past to conceptualize the construct. The literature review and cognitive interviews were used to select the items representing the three variables of interest.

The teacher responses to the items constitute the raw data that was screened for normality, lack of multicollinearity, linearity, and analysis of missing values. This screening is essential as it aids in reducing the bias and increasing the reliability and validity of a scale. At the heart of factor analysis is the correlation matrix (R matrix) that shows the bivariate correlation coefficients for the items and is used to examine the pattern of relationship among items. In this regard, checking correlation values to flag higher values of correlation coefficients is advised as it is impossible to determine the

unique contribution of each item to the factor when the items are highly correlated (Field, 2013). As a guideline, items with bivariate correlation coefficients with an absolute value from .30 to .80 are preferred (Kline, 2014; Tabachnick & Fidell, 2007); items with correlation values lower than .30 explain less than 9% of the total variance and therefore will not factor well. On the other hand, items with high correlations pose previously discussed multicollinearity issues. A statistically significant result from Bartlett's Test of Sphericity (BTS) will highlight that the correlation matrix is different from identity matrix (i.e., no correlation between items) thereby strengthening the idea that items are correlated, and factor analysis can be used to analyze the scales representing the three variables.

Analysis of missing data is warranted to ascertain that data are missing completely at random. Hence, a non-significant result is expected for Little's MCAR Test. If 5% or less of data is missing at random, deletion is a good alternative, else Estimation Maximization (EM) methods were used for imputation of data. However, if the data show evidence of non-randomness in the pattern of missing data, also called Missing not at random, (MNAR), estimation maximization methods of imputation are not suitable as they are based on the principle of randomness of missing values. If the data is MNAR, imputation methods that preserve all cases for analysis were used (Tabachnick & Fidell, 2007).

During the screening of the data, sample size adequacy was examined. Though there is no consensus in research about sample size requirements (Field, 2013), recently Meyers, Gamst, and Guarino (2016) have suggested at least 20 respondents per item and

at least 200 total respondents. A measure of sampling adequacy such as values of Kaiser-Meyer-Olkin (KMO) was of aid in deciding if sufficient responses per item exist for factor analysis. KMO measure uses squared partial correlations to check the adequacy of sample size that will yield distinct and reliable factors. KMO value can range from 0 to 1, and a value closer to 1 indicates a robust factor solution while values lower than .6 are indicative of barely acceptable solution (Field, 2013).

Various methods are available for factor extraction and rotation; four commonly used extraction methods are Maximum Likelihood (ML), Generalized Least Squares (GLS), Principal Component Analysis (PCA) and Principal Axis Factoring (PAF). For factor analysis of data from this study, principal axis factoring was used to maximize the variance extracted by the factors. Principal axis factoring method makes the least distributional assumptions, handle highly non-normal data and is a widely used technique for preliminary extraction (Tabachnick & Fidell, 2007). Rotation of factors is performed after extraction to maximize the high correlation between factor and items and minimize weak correlations. A myriad of rotation methods are available, but for this study, as a single factor solution for each variable is desired; hence much discussion of factor rotation is futile. To confirm the presence of a single factor solution for each variable, varimax rotation (default option in most statistical programs), was retained for analysis.

The number of factors to retain from the factor analysis (factor retention criteria) has been described as an arduous task (Cudeck, 2000), so any criteria have to be embedded in theory and supported by past practices (Bandalos & Finney, 2010; Miller, 2013). As described in Chapter 2, the theoretical framework used and past research in the

development of teacher efficacy scale, teacher collaboration scale and school academic press scale, has shown evidence of a single factor solution for each of these variables. Instead, any deviation from the single factor solution for any of the three variables will be an indicator of misfit items in the model (Tabachnick & Fidell, 2007). In this regard, the iterative process was used to identify most items that load on only one factor, and the factor explains the highest percentage of total variance.

Though a single factor solution is desired for each variable, statistical criteria were also used to check the interpretability of factors. In EFA, eigenvalue criterion (also known as Kaiser's Rule) and scree plots are commonly used to determine the number of factors. The eigenvalue is a measure of the proportion of variance in the items explained by a factor (Kline, 2014). In EFA, variance in the correlation matrix is condensed into eigenvalues, so the factor with the highest eigenvalue has the most variance. For example, in a scale consisting of 5 items, there is a maximum of 5 standardized units of common variance that can be explained by the factor solution. A factor with an eigenvalue of say 3.4 in an analysis of the five items, explains 68% of the variance in the items analyzed (3.4/5.0). According to Kaiser's Rule (Kline, 2014; Tabachnick & Fidell, 2007) factors with eigenvalues greater than one should be retained because any factor that explains more than 1 unit of shared variance, explains more common variance than any one item. Scree-plots offer a graphical tool to explore the relationship between eigenvalues and the number of factors. Scree-plots have a characteristic shape of a sharp descent followed by tailing off, and the point of inflection in the curve is used as the cut-off for deciding about the number of factors to retain (Field, 2013).

In addition to the decision about the number of factors to retain, information about the performance of individual items is crucial in scale development. In EFA, the performance of an item is examined by looking at the values of factor loadings and communalities of items. Factor loading is a standardized regression coefficient that represents the standardized effect of a factor on the items. The values of factor loadings range from -1 to 1, where extreme values denote a strong effect of the factor on the variable. Usually, researchers retain item with a factor loading of .32 or higher as the factor explains 10% of the common variance (Meyers et al., 2016). Caution must be exerted when items are cross-loading on two or more factors. For example, an item may have a primary loading of .65 on one factor and .35 on another. Retaining such items in the solution can lead to false interpretations because when an item is partially explained by two or more factors, interpreting any one factor in isolation is not possible. Hence, cross-loading of items on two or more factors has been used as a primary reason for the deletion of an item (Bandalos & Finney, 2010; Tabachnick & Fidell, 2007).

In addition to factors, values of communalities are also used to assess the performance of items in a scale. Communality of an item is defined as the proportion of variance that is explained by the extracted factor solution and is obtained by the sum of the squares of factor loadings. The value of communality can range from 0 to 1, where 0 indicates an item that shares no variance with other items and communality of 1 indicates an item that shares all variance with other items. So, a higher value of communality indicates that item is a good measure of the construct. For example, a communality of .68 for an item denotes that, 68% of the variance associated with this item is shared or

common variance. A communality of .5 or above is typically used as an appropriate communality value (Bandalos & Finney, 2010; Tabachnick & Fidell, 2007).

Evaluating the adequacy of the factor solution is the final step in EFA. In addition to theoretical interpretability, the factor solution should also represent a parsimonious structure: all items have high loading on one factor, and low loadings on others and each factor is associated with multiple items (Thompson, 2004). Once the parsimonious factor solution is obtained for each scale, a reliability analysis was performed to measure the consistency of an item to measure the construct. A Cronbach alpha value of .80 is considered good (Field, 2013; Knapp & Mueller, 2010). The divergent, convergent and criterion-referenced validity of the scales was established. The scores of retained teacher efficacy items and teacher collaboration items were aggregated at the teacher-level to obtain a score of teacher efficacy and a score of teacher collaboration for each teacher in the study. As Academic Press is a school-level variable, teacher scores of retained academic press items were aggregated at the school-level to obtain a score for the school academic press. The scores for the three variables were used for further multilevel analysis.

Multi-level Analysis

In this study, teacher efficacy and teacher collaboration are measured at the teacher-level (individual-level), while the academic press is measured at the school-level (organizational-level). Because of this multi-level complexity, one encounters the perennial problem of a unit of analysis. One way to address the unit of analysis problem is to aggregate the individual level variable (TE) at the school-level and use Ordinary

Least Squares Regression (OLS). However, upon aggregation, the researcher does not measure the same thing; instead, the researcher is analyzing group data to formulate conclusions at the individual level. The aggregation can also lead to ecological fallacy, where conclusions about individual-level variables are made based on group level data.

Research has consistently shown that individuals within a group tend to be more like each other regarding an outcome variable than they are to individuals in a different group (Hox, Moerbeek, & Van de Schoot, 2017). Due to these group (or nesting) effects, one expects scores of teachers in the same school to be more alike than scores for teachers from different schools. Therefore, treating teachers as if they are independent of the school will ignore the complexity of data and introduce bias in the analysis (Heck, Tabata, & Thomas, 2013). This dependence of observations has been called a nuisance as it violates two critical assumptions of regression analysis that errors are uncorrelated, and variance of the error is homoscedastic (Snijders & Bosker, 2012, p. 6). Ordinary Least Squares Regression fails to consider the nested structure of the data where teachers (and students) are nested (housed) within the schools. These violations of assumptions can lead to underestimated variance and standard errors that may lead to erroneous conclusions. Ignoring the clustering of teachers (and students) in the schools can also produce confidence intervals that are too narrow (and p-values too small), leading to the wrong inference that the predictor affects the outcome whereas, in reality, the effect was due to chance. (Raudenbush & Bryk, 2002).

Though "dependence of observations is a nuisance, it can also be an interesting phenomenon to study" (Snijders & Bosker, 2012, p. 8) and nested structure of teachers

(and students) in schools offer germane conditions to study the dependence of observations. Due to group effects, one expects teachers (and students) at a school to be more similar in an outcome compared to teachers (and students) from other schools. The more teachers (and students) within a school are similar to an outcome variable, the more likely that some group or organizational predictors might be at play.

A multi-level analysis is a statistical approach that considers the clustering or nesting of data (dependence of observations) and resolves the unit of analysis problem. Simply stated multilevel analysis is an extension of multiple regression with simultaneous multiple regressions at various levels ((Ma, Ma, & Bradley, 2008) while accounting for nesting. Ma et al. (2008, p. 65) succinctly summarized the advantages of multilevel modeling as "it accounts for:

a. the dilemma of the unit of analysis,
b. the problem of dependencies of individual responses within groups,
c. confounding variables at both within-and between-group levels,
d. detection of cross-level interactions, and
e. the manipulation of random coefficients".

With so many purported advantages and computational advancements, last three decades have seen a proliferation of the use of multilevel modeling of educational data (Hox et al., 2017; O'Connell & McCoach, 2008; Raudenbush & Bryk, 2002). Specifically, over last 20 years in the field of educational administration, seminal works have employed multilevel modeling methods to account for clustering of data (R. D.

Goddard et al., 2015; Goddard, Hoy, et al., 2000; Goddard, Sweetland, et al., 2000; Heck et al., 2013).

Multi-level models are also referred to as contextual models, mixed-effect models, random effect models, variance component models, or intercept and slopes as outcome models. When the regression model is linear, the type of multi-level model is called hierarchical linear model (HLM). For this study, hierarchical linear modeling was employed, so the words multilevel model or HLM are used interchangeably. Specifically, five models were explored to examine the relationship between teacher efficacy and teacher and school-level variables:

Model 1: the unconditional or null model in which no level-1 or level-2 predictors were used. This is represented by equation 1 below.

Model 2A: a one-way ANCOVA with random effects model (equation 2A) with fixed predictors where the within-school slope of level-1 predictors is fixed i.e., it does not vary across organizations.

Model 2B: a random coefficient regression model where both the intercepts and slopes of level-1 predictor are conceived as varying randomly over level-2 units (equation 2B).

Model 3A: the intercepts- and slopes- as outcomes model in which level-2 variables are added to model 2. This model does not have any interaction between teacher-level and school-level variables and can be represented as equation 3A.

Model 3B: builds upon model 3A by introducing a cross-level interaction between teacher-level and school-level variables. This model was used to gauge if school-level variables moderate the effect of teacher-level variables on teacher efficacy.

Null or Unconditional Model

To the simple regression model that contains only one level, the addition of school-level variables leads to more complex multilevel models. In the two-level model, the residual term is partitioned to two levels (r_{ij} and u_{0j}), where, j indicates that teacher i belongs to school j. A two-level null or unconditional model can be represented as:

Level-1 (Teacher) $\quad Y_{ij} = \beta_{0j} + r_{ij}$

Level-2 **(**School) $\quad \beta_{0j} = \gamma_{00} + u_{0j}$ (1)

where at level-1, Y_{ij} is the teacher efficacy score for teacher i in school j, β_{0j} the average teacher efficacy (TE) for school j, r_{ij} represents variation in teacher efficacy among teachers in school j and measures the level one random effect. r_{ij} is assumed to have a normal distribution with a mean of zero and a variance of σ^2 i.e., $r_{ij} \sim N(0, \sigma^2)$. At level-2, γ_{00} is the intercept and represents the overall average of teacher efficacy (TE) across all schools, u_{0j} represent the variation in teacher efficacy among schools and measures level two random effect. u_{0j} is assumed to have a normal distribution with a mean of zero and level two variance of $\tau_{00,}$ i.e., $u_{0j} \sim N(0, \tau_{00})$.

Simply stated the null model decomposes the total variance in teacher efficacy scores (TE) into among teachers (within-school variance, σ^2) and variance among schools (between-school variance, τ_{00}). The proportion in the variance between schools is called Intraclass Correlation (ICC) and is calculated by dividing variance at school-level (τ_{00}) by total variance ($\sigma^2 + \tau_{00}$). ICC informs us about the amount of total variability in the

outcome (TE) that lies between schools and also estimates the degree to which two members from the same group resemble each other (degree of clustering) (O'Connell & McCoach, 2008; Steele, 2008). An ICC value above 5% is considered a good indication to preceded with multilevel analysis (Raudenbush & Bryk, 2002). To formally test that the estimated value of between-school variance (τ_{00}) is significantly greater than zero, a Chi-square test was performed to check the null hypothesis that $\tau_{00} = 0$. A significant result showed that the null hypothesis is improbable indicating that variation does exist between schools in teacher efficacy scores. In later models, teacher and school-level variables were added systematically to observe if between-school variance changes.

The unconditional model also serves as a starting point or baseline model to later compare more complex models. For research question one, the above null or unconditional model was used to partition the total variance in teacher efficacy into its within and between-school components. This model allowed the researcher to ascertain the need for multilevel analysis.

Within School Models

The within-school models included only level-1 (teacher-level) predictors: demographic variables (gender, ethnicity, years of teaching experience, years in the building, and educational level) and teacher collaboration (TC). All level-1 predictors were grand-mean centered so that the solution can be compared against the mean of all schools. For within-school models, each teacher-level variable was added, one at a time, to the unconditional model, starting with the demographic variables. The stepwise addition is recommended when there can collinearity among variables (McCoach, 2010b;

Snijders & Bosker, 2012). In the final model, only variables that were statistically significant were retained. Initially, all variables were treated as fixed effects, i.e., effects of the variable are the same across schools. This level-1 fixed effect Model 2A can be shown as:

$$\text{Level-1 (Teacher)} \qquad Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + r_{ij}$$

$$\text{Level-2 (School)} \qquad \begin{aligned} \beta_{0j} &= \gamma_{00} + u_{0j} \\ \beta_{1j} &= \gamma_{10} \\ &\ldots \\ \beta_{qj} &= \gamma_{q0} \end{aligned} \qquad \text{(2A)}$$

where Q = number of independent variables at level-1, X = level-1 independent variables and β_{1j} to β_{qj} are the slope estimates for the fixed effects of level-1 predictors.

In the fixed effect Model 2A, only the intercept parameter from the level-1 model (β_{0j}), is assumed to vary at level-2 (as shown by + u_{0j} term at level-2). Here all teacher-level variables are assumed to have the same effect across schools, i.e., each teacher-level variable has fixed slope and individual differences associated with teacher-level variables are same across the schools (Ma et al., 2008). Whether to consider an effect as fixed or random is based on past research and the hypothesis of the study. It is recommended to initially consider all level-1 variables as fixed effect and in subsequent model explore if any of the level-1 slopes have a significant variance component between schools. Testing random slopes is best accomplished systematically, one variable at a time, since if one test several slopes simultaneously, the solution may fail to converge (Heck et al., 2013) In this regard, Model 2B was evaluated in which the slope of each teacher-level variable

varied across schools. In equation 2A above, level-2 term a random effect was added, and the structural equation can be represented as:

Level-1 (Teacher) $$Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + r_{ij}$$

Level-2 (School)
$$\beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$
$$\ldots$$
$$\beta_{qj} = \gamma_{q0} + u_{qj} \qquad (2B)$$

where Q = number of independent variables at level-1, X = level-1 independent variables and β_{1j} to β_{qj} are the slope estimates for the fixed effects of level-1 predictors.

Three common types of hypothesis tests are used for hierarchical models: a t-ratio test for fixed effects and random level-1 coefficients and a chi-square test for variance component. Models 2A and 2B were tested for the fixed effect null hypothesis that on average, teacher-level variable has no effect on β_{qj} and is not related to teacher efficacy within schools i.e.,

$$H_0 : \quad \gamma_{q0} = 0.$$

A significant value of t-test for Model 2A and 2B indicated that the fixed effect is non-zero and the teacher-level variable is related to teacher efficacy within schools.

For level-1 β's the hypothesis that a particular regression coefficient for an individual school is null can be formulated as

$$H_0 : \quad \beta_{qj} = 0.$$

A significant value of t-test indicated that X_{qij} has effect on teacher efficacy.

In all application of HLM researcher needs to decide if level-1 coefficients are specified as fixed, random or nonrandomly varying. To ask whether random variation exists, one can test a null hypothesis

$$H_0 : \quad \tau_{qq} = 0$$

where $\tau_{qq} = \text{Var}(\beta_{qj})$. If the null hypothesis is rejected, one may conclude that there is random variation in β_q. Here a significant value of the chi-square test indicated that the null hypothesis can be rejected and the relationship between that teacher-level variable and teacher efficacy does vary across schools. In Models, 2A and 2B chi-square test statistics were analyzed for the hypothesis that random variation exists and each of the variance components is zero. For example, Model 2A leads to only one variance value (for intercept $\text{Var}(\beta_{0j}) = \text{Var}(u_{0j}) = \tau_{00}$) and in Model 2B for a single variable one obtains two values of variance (for intercept $\text{Var}(\beta_{0j}) = \text{Var}(u_{0j}) = \tau_{00}$ and for slope $\text{Var}(\beta_{1j}) = \text{Var}(u_{1j}) = \tau_{11}$). A chi-square test of significance was performed on each of these variance values. Both Models 2A and 2B were examined for convergence and model fit criteria to decide the better of the two models that were used for the full model.

Full Model

For full model, to the statistically significant variables from Model 2 (A or B), school-level variables were added. Level-2 or school-level predictors are school academic press and eight contextual variables (school type, priority school status, the proportion of students economically disadvantaged, the proportion of minority students, the proportion of mobile students, school size, prior achievement scores in mathematics and reading). Like Model 2, stepwise addition of school-level variables was used in Model 3A and only statistically significant predictors were retained. This lead to the combined Model 3A that only has statistically significant predictor variables at the teacher and school-level. The above method was used to identify teacher and school-level variables that account for the variation in teacher efficacy among teachers and between schools.

Level-1 (Teacher) $$Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + r_{ij}$$

Level-2 (School)
$$\beta_{0j} = \gamma_{00} + \sum_{s=1}^{s} \gamma_{0s} W_{sj} + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$
$$\ldots$$
$$\beta_{qj} = \gamma_{q0} + u_{qj} \qquad (3A)$$

where Q is the number of independent varaibles at level-1, X = level-1 independent varaibles, S is the number of level-2 independent varaibles and W = level-2 independent varaibles

If there were variables at level-1 that have statistically significant random slopes (i.e., Model 2B), a Model 3B was used to examine whether the relationship between the teacher-level variable and teacher efficacy depends on the statistically significant school-level variable. To test this, an interaction term consisting of the product of teacher-level and school-level variables is added to the model. A statistically significant value of the estimate indicated that the school-level variable moderates the slope of the teacher-level variable and teacher efficacy.

For each model, the model fit indices were calculated to measure the explanatory power of models (Ferron et al., 2008; Miller, 2013). Model fit indices help in deciding if the model at hand is better at explaining the observed data. Two most common methods of model selection are hypothesis testing approaches and the fit index comparison approach. Both methods are based on the deviance statistics that compares the log-likelihood of the present model to the log-likelihood of a model that fits the data perfectly (McCoach & Black, 2008; Singer, Willett, & Willett, 2003). Deviance statistics serve as an indicator of the badness of fit of a given model and cannot be interpreted directly as the deviation is a function of model fit and sample size. Specifically, change in deviance (ΔD) is calculated by subtracting deviance of a complex model (D2) from the deviance of the simpler model (D1). In large samples, the differences between the deviances of two hierarchically nested models is distributed as an approximate chi-square distribution with degrees of freedom equal to the difference in the number of parameters being estimated between the two models.

In hypothesis testing approaches, a chi-square difference test is utilized to compare the deviance statistics of the two nested models. The difference in deviance is statistically significant when delta ΔD is greater than the critical value of chi-square with $(p_1 - p_2)$ degrees of freedom, where p_1 is the number of parameters in the larger model and p_2 is the number of estimated parameters in the smaller model (McCoach & Black, 2008). In the index comparison approach, the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are calculated from the value of deviance using the formulae,

$$AIC = D + 2p$$

$$BIC = D + \ln(n) + p$$

where D is deviance, p = number of estimated parameters and n is the sample size (Snijders & Bosker, 2012).

When there are competing models, a model with lower values of AIC and BIC is considered to be a better model. The combined use of AIC and BIC in conjunction with chi-square difference tests is recommended as an informative approach to gauge model fit, and the same method was adopted in this study (McCoach, 2010a; McCoach & Black, 2008; Snijders & Bosker, 2012).

In addition to the model fit, the explanatory power of multilevel models was also examined. The proportional reduction in variance (or variance explained) at level-1 and level-2 is calculated for various models by comparing the variance of a complex model with the variance from the null or unconditional model. At teacher-level, the proportional reduction in within-school variance is calculated by the ratio of the difference of level

one variance of the new model and the unconditional model (σ^2_n - σ^2_u) to the null model variance (σ^2_u). Using similar formula at the school-level (level-2), the proportional reduction in between-school variance (τ_{00}) was calculated (Hox et al., 2017; McCoach & Black, 2008; Raudenbush & Bryk, 2002). At each step of model construction, model fit, and model adequacy was evaluated using deviance for every model that has been made from the null model. Thus, comparing the variance estimates from model 1 (unconditional model) with models 2A, 2B, 3A, or 3B one can calculate the index of proportion reduction in variance or variance explained by each successive model.

To summarize, multi-level modeling allows for an understanding of how an individual level variable, as well as group level variables, can be used to explain an outcome of interest (measured at the lowest level of analysis) (Heck et al., 2013). A hierarchical system allows for a study of interactions not only within the levels (between two individual level or school-level variables) but also between levels (between variables at individual and group level). The primary goal of multilevel modeling is to be able to examine the group differences in the relationship among variables while modeling the dependency that exists in clustered data (Raudenbush & Bryk, 2002).

Chapter 4. Results

This chapter is divided into two major sections: results of factor analysis and results of the multilevel analysis. Each section starts with a description of the sample, the univariate descriptive, and bivariate correlational statistics for variables used in that statistical analysis. Results from missing value analysis and a check of assumptions for factor analysis and multilevel analysis are also presented. Finally, results of (a) factor analysis of three variables: teacher efficacy, teacher collaboration, and school academic press and (b) results of hierarchical linear modeling performed to assess the relationship between teacher efficacy, teacher collaboration, and school academic press are provided. The factor analysis section includes reliability and validity analysis of three scales, and the model fit analysis is provided in the multilevel modeling section.

Factor Analysis

Exploratory factor analysis (EFA) using Principal Axis Factoring with Varimax rotation was used to construct scales for the three variables. After performing a missing value analysis of the data, a check of assumptions of the multivariate analysis: assumptions of normality, linearity, and lack of multicollinearity was conducted. An effort was made to extract a single factor solution for each of the three variables studied. In this regard, the iterative process was used so that most items load on only one factor and the factor explains the highest cumulative percentage of variance. This process was

used to calculate the factor score for each variable. The following section describes the sample size and the results of the factor analysis for each variable.

Factor Analysis of Teacher Collaboration (TC)

Teacher Collaboration was measured using a five-item teacher collaborative practices scale developed by Righter (2016). Teachers evaluated the items by using a 6-point Likert scale ranging from 1 to 6, where 1, indicated the respondent *strongly disagree*s, and 6 indicated the respondent *strongly agree*s.

Responses from 400 teachers were analyzed to ascertain whether the missing values were missing completely at random (MCAR). It was observed that the percent of missing responses ranged from 0.5% (Item TC1) to 2.25% (Item TC3) and all items had percent missing responses below the threshold of 5% (Johnson & Young, 2011; Schafer & Graham, 2002; Tabachnick & Fidell, 2007). Also, a statistically non-significant result of Little's MCAR test indicated that the data are indeed missing completely at random (χ^2 (17, N = 391) = 14.74, p = .614). Therefore, estimation-maximization (EM) was used to estimate missing data to give consistent and unbiased estimates of correlations and covariances.

The descriptive statistics in Table 4.1 show that the mean scores of items were close to each other as evidenced by the narrow range of mean scores (4.53 for item TC3 to 4.77 for item TC1) and that for each item, the average response was slightly agreed or higher. The data are negatively skewed as the value of skewness of all items is below 0. However, the value of skewness is between the acceptable range of -1.0 to +1.0. Thus, for further analysis, one can consider the data to be approximately normal in distribution.

Table 4.1 *Descriptive Statistics for Items of Teacher Collaboration Scale*

Item	*N*	*M*	*SD*	Skew
All teachers on my team implement agreed upon instructional practices. (TC1)	398	4.77	1.17	-1.1
All teachers on my team bring student work back to the team for analysis. (TC2)	396	4.59	1.24	-.85
My team designs lessons based on student strengths and weaknesses identified in the data. (TC3)	391	4.53	1.34	-.81
My teacher team analyzes common assessment results to determine instructional practices to implement. (TC4)	396	4.71	1.24	-.94
My team analyzes common post-test results to determine which instructional strategies worked best. (TC5)	394	4.70	1.18	-.92

A bivariate correlational analysis was performed to examine the association between the five items. Table 4.2 displays the correlation matrix for the five items of teacher collaboration scale. Each item is positively and significantly correlated to other items, and the value of correlation coefficients ranged from .65 to .77, with no value higher than .80.

Table 4.2 *Correlation Matrix for Items of Teacher Collaboration Scale*

	TC1	TC2	TC3	TC4	TC5
TC1	1				
TC2	.76***	1			
TC3	.65***	.67***	1		
TC4	.77***	.72***	.77***	1	
TC5	.67***	.71***	.67***	.73***	1

*** p < .001

Principal axis factoring with varimax rotation was conducted on the five items of teacher collaboration scale. The Kaiser-Meyer-Olkin (KMO) measure was used to verify the sampling adequacy for factor analysis. The KMO value of .88 was above the acceptable limit of .50 (Field, 2013). Results of the factor analysis of the five items of teacher collaboration scale with factor loading and communality are displayed in Table 4.3. All five items had loadings ranging from 0.81 to 0.89 and communalities ranging from .66 to .81. Additionally, 77% of the variance was accounted for by a single-factor, suggesting that this single dominant factor alone comprised the latent structure of the teacher collaboration. The single-factor structure was favored over a two-factor structure because examination of the eigenvalues showed a sharp decrease from 3.85 (77% variance explained) for the single factor to .38 (7.6% variance explained) for the two-factor model.

Table 4.3 *Exploratory Factor Analysis of Teacher Collaboration Scale*

Item	Factor Loading	Communality
All teachers on my team implement agreed upon instructional practices. (TC1)	.845	.714
All teachers on my team bring student work back to the team for analysis. (TC2)	.851	.724
My team designs lessons based on student strengths and weaknesses identified in the data. (TC3)	.810	.656
My teacher team analyzes common assessment results to determine instructional practices to implement. (TC4)	.898	.806
My team analyzes common post-test results to determine which instructional strategies worked best. (TC5)	.816	.666
Eigenvalue	3.85	
% of Total Variance	77.00	

Teacher Collaboration scale had high reliability with Cronbach's α of .93, 95% *CI* [.91, .94]. These results provide evidence that the five items represent a single construct of teacher collaboration. Accordingly, a mean score of teacher collaboration scale (TC) for each teacher was calculated to be used as a teacher-level predictor variable for multilevel analysis.

Factor Analysis of Teacher Efficacy Scale (TE)

Teacher Efficacy was measured using a four-item scale previously used by Goddard and Goddard (2001). The scale is based on Gibson and Dembo's (1984) teacher efficacy scale, and past research has shown that the items are reliable and converge to give a single factor solution (Hoy & Woolfolk, 1993). Teachers evaluated the items by using a 6-point Likert scale ranging from 1 to 6, where 1, indicated the respondent *strongly disagrees*, and 6 indicated the respondent *strongly agrees*.

Responses from 400 teachers were analyzed to ascertain whether the missing values were missing completely at random (MCAR). It was observed that the percent of missing responses ranged from 1.0% (Items TE1 and TE3) to 1.7% (Item TE4) and were below the threshold of 5%. Also, a statistically non-significant result of Little's MCAR test indicated that the data are indeed missing completely at random (χ^2 (14, N = 393) = 24.35, p = .421). Therefore, estimation-maximization (EM) can be used to estimate missing data to give consistent and unbiased estimates of correlations and covariances.

The descriptive statistics in Table 4.4 reveal that the mean scores of items were close to each other as evident by the narrow range of scores (4.30 for item TE1 to 4.84 for item TE3) and that for each item, the average response was slightly agreed or higher. Though the data are negatively skewed, the value of skewness is between the acceptable range of -1.0 to +1.0; thereby one can consider the data to be approximately normal in distribution.

Table 4.4 *Descriptive Statistics for Items of Teacher Efficacy Scale*

Item	*N*	*M*	*SD*	Skew
If a student did not learn content from a previous lesson, I am confident I would be able to increase his/her retention in the next lesson. (TE1)	396	4.30	1.19	-.60
If a student in my class become disruptive or noisy, I feel confident that I can redirect him/her quickly. (TE2)	394	4.68	1.14	-.90
If one of my students could not do a class assignment, I would be able to assess accurately whether the assignment was at the correct level of difficulty. (TE3)	396	4.84	.97	-.82
If I try really hard, I can get through to even most difficult or unmotivated students. (TE4)	393	4.47	1.11	-.58

A bivariate correlational analysis was conducted to examine the relationship between the four items of the teacher efficacy scale. Table 4.5 provides the correlation matrix for the four items of the teacher efficacy scale. Each item is positively and significantly correlated, and the values of correlation coefficients range from .38 to .47, an acceptable range for factor analysis.

Table 4.5 *Correlation Matrix for Items of Teacher Efficacy Scale*

	TE1	TE2	TE3	TE4
TE1	1			
TE2	.447***	1		
TE3	.370***	.473***	1	
TE4	.376***	.409***	.468***	1

*** $p < .001$

Principal axis factoring with varimax rotation was conducted on the four items of teacher efficacy scale. The Kaiser-Meyer-Olkin measure (KMO value) of .76 shows that the sample size is adequate for analysis. Results of the factor analysis of four items of teacher efficacy scale with factor loading and communality are displayed in Table 4.6. All four items had loadings ranging from .59 to .69 and communalities ranging from .35 to .48. Additionally, 56.8% of the variance was accounted for by a single factor, suggesting that this single dominant factor alone comprised the latent structure of the teacher efficacy. The single-factor structure was favored over the next two-factor structure as the examination of the eigenvalues showed a sharp decrease from 2.73 (56.8% variance explained) for the single factor to .66 (16.6% variance explained) for the two-factor model.

Table 4.6 *Exploratory Factor Analysis of Teacher Efficacy Scale*

Item	Factor Loading	Communality
If a student did not learn content from a previous lesson, I am confident I would be able to increase his/her retention in the next lesson. (TE1)	.593	.352
If a student in my class become disruptive or noisy, I feel confident that I can redirect him/her quickly. (TE2)	.694	.481
If one of my students could not do a class assignment, I would be able to assess accurately whether the assignment was at the correct level of difficulty. (TE3)	.683	.466
If I try really hard, I can get through to even most difficult or unmotivated students. (TE4)	.636	.405
Eigenvalue	2.273	
% of Total Variance	56.83	

Teacher Efficacy scale had a high reliability with Cronbach's α of .74, 95% CI = [.72, .76]. These results provide evidence that the four items represent the single construct of teacher efficacy. Accordingly, a mean score of teacher efficacy scale (TE) for each teacher was calculated to be used as a teacher-level outcome variable for multilevel analysis.

Factor Analysis of Academic Press Scale (AP)

Academic Press was measured using a nine-item academic press scale developed for this study. Teachers' evaluated the items by using a 6-point Likert scale ranging from 1 to 6, where 1, indicated the respondent *strongly disagrees*, and 6 indicated the respondent *strongly agrees*.

Responses from 344 teachers were analyzed to determine whether the missing values were missing completely at random (MCAR). It was observed that the percent of missing responses ranged from 0.58% (Item AP6) to 2.90% (Item AP7) and were below the threshold of 5%. Also, a statistically non-significant result of Little's MCAR test indicated that the data are indeed missing completely at random (χ^2 (91, N = 334) = 125.36, p =.107). Therefore, estimation-maximization (EM) can be used to estimate missing data to give consistent and unbiased estimates of correlations and covariances.

The descriptive statistics in Table 4.7 indicate that the mean score of items was in the range of 3.42 (Item AP2) to 4.83 (Item AP6) and the data are negatively skewed. However, most items had skewness value between the recommended range of -1.0 to +1.0, so one can consider the data to be approximately normal in shape. Only one item, AP6 had a skewness of -1.17, beyond the recommended range.

Table 4.7 *Descriptive Statistics for Items of Academic Press Scale*

Item	*N*	*M*	*SD*	Skew
This school has high expectations for student academic achievement. (AP1)	336	4.81	1.17	-.87
In this school classroom disruptions are infrequent. (AP2)	339	3.42	1.68	-.05
This school holds teachers accountable for academic success of students. (AP3)	342	4.82	1.07	-.94
Teachers at this school support each other to improve student academic achievement. (AP4)	339	4.60	1.16	-.85
This school responds immediately to disruptions of academic time. (AP5)	340	3.96	1.48	-.48
Teachers at this school frequently assign homework. (AP6)	342	4.83	1.16	-1.17
Teachers at this school provide timely feedback on homework. (AP7)	334	4.43	1.11	-.70
Exemplar student work is visible in this school. (AP8)	340	4.59	1.20	-.69
In this school students are promoted only when they master content. (AP9)	336	3.64	1.51	-.25

A bivariate correlation Analysis was conducted to measure the amount of association between the nine-items. Correlation matrix in Table 4.8 highlights that each item is positively and significantly correlated and the value of correlation coefficients range from .21 to .67. However, a few positive and significant correlations are below .4, and the majority of the low correlations involved Item AP2.

Table 4.8 *Correlation Matrix for Items of Academic Press Scale*

	AP1	AP2	AP3	AP4	AP5	AP6	AP7	AP8	AP9
AP1	1								
AP2	.39**	1							
AP3	.67**	.34**	1						
AP4	.64**	.37**	.65**	1					
AP5	.61**	.61**	.48**	.61**	1				
AP6	.40**	.21**	.40**	.45**	.34**	1			
AP7	.51**	.38**	.50**	.56**	.48**	.60**	1		
AP8	.51**	.33**	.47**	.48**	.47**	.40**	.57**	1	
AP9	.46**	.44**	.44**	.46**	.55**	.23**	.50**	.43**	1

** $p < .01$

Upon conducting Principal axis factoring with varimax rotation on the nine items of academic press scale, a two-factor solution emerged. Table 4.9 provides the rotated factor loadings of each factor and loadings above .32 have been highlighted. The eigenvalues for two factors was 4.80 and 1.01, and both factors account for 65.6% of the total variance. This two-factor solution is counter to the parsimonious single factor solution expected for the academic press (Goddard, Sweetland, et al., 2000; Hoy et al., 1991; Hoy & Woolfolk, 1993; Sweetland & Hoy, 2000) and lacks theoretical interpretability. In addition to the unexpected two-factor solution, cross-loading of items on more than one factor was observed, suggesting that an item is partially explained by

two factors thereby hampering the interpretation of both factors. Specifically, three items (AP6, AP7, AP8) load well on factor 1, two items (AP2, AP5) load well on factor 2, but four items (AP1, AP3, AP4, and AP9) cross-load on both factors.

Table 4.9 *Factor Loadings for Two-Factor Solution of Academic Press Scale*

	Factor 1	Factor 2
Teachers at this school provide timely feedback on homework. (AP7)	**.718**	.322
Teachers at this school frequently assign homework. (AP6)	**.658**	.109
Teachers at this school support each other to improve student academic achievement. (AP4)	**.617**	**.479**
This school holds teachers accountable for academic success of students. (AP3)	**.607**	**.410**
This school has high expectations for student academic achievement. (AP1)	**.578**	**.519**
Exemplar student work is visible in this school. (AP8)	**.560**	.367
This school responds immediately to disruptions of academic time. (AP5)	.316	**.817**
In this school classroom disruptions are infrequent. (AP2)	.174	**.638**
In this school students are promoted only when they master content. (AP9)	**.337**	**.570**
Eigenvalue	4.803	1.01
% of Total Variance	53.37	11.23

Note: Factor loadings over .30 appear in bold.

Due to both theoretical and statistical reasons, this two-factor solution was considered spurious and individual item performance was evaluated so that poorly functioning item(s) can be deleted from the analysis. It was observed that Item AP2 (*In this school classroom disruptions are infrequent*) had the weakest correlation with other items, the lowest value of communality and the smallest value of loading on factor 1. Upon inspection, the wording of the item, especially the word infrequent can be confusing as it is not a typical use of the word. Hence, Item AP2 was deleted from the scale, and another EFA was performed on the eight items.

Principal axis factoring with varimax rotation was conducted on the eight items of Academic Press scale. As evident in Table 4.10, a single factor solution that accounts for 55.7% of the total variance was observed. The one-factor solution had an eigenvalue of 4.45 and factor loading ranged from .55 to .78. The single-factor structure was favored over the next most-viable model, a two-factor structure because an examination of the eigenvalues showed a sharp decrease from 4.45 (55.68% variance explained) for the single factor to .88 (10.95% variance explained) for the two-factor model.

This eight-item Academic Press scale had high reliability with Cronbach's α of .89, 95% *CI* [.86, .90]. As Academic press is a school-level variable, teacher responses to the items were aggregated at the school-level thereby giving each school a score for the academic press.

Table 4.10 *Exploratory Factor Analysis of Academic Press (AP) Scale*

	Factor Loading	Communality
This school has high expectations for student academic achievement. (AP1)	.783	.613
This school holds teachers accountable for academic success of students. (AP3)	.743	.552
Teachers at this school support each other to improve student academic achievement. (AP4)	.784	.615
This school responds immediately to disruptions of academic time. (AP5)	.717	.514
Teachers at this school frequently assign homework. (AP6)	.552	.305
Teachers at this school provide timely feedback on homework. (AP7)	.745	.555
Exemplar student work is visible in this school. (AP8)	.664	.441
In this school students are promoted only when they master content. (AP9)	.614	.377
Eigenvalue	4.454	
% of Total Variance	55.68	

The results from exploratory factor analysis also helped to establish the convergent and discriminant validity of the scales. Recall that both forms of the survey contained items about teacher efficacy. When EFA was performed on the two forms of the survey, items belonging to common construct exhibited factor loadings of 0.50 or

higher on a single factor (i.e., convergent validity), and items did not show any cross-factor loadings to other constructs (i.e., discriminant validity).

Unlike the charter schools, the traditional public-school participants in the study were mandated by the state to implement teacher collaboration in TBT's. To establish criterion-referenced validity of teacher collaboration it was hypothesized that teacher collaboration is significantly higher in traditional public schools than charter schools. A t-test showed that the mean teacher collaboration score for traditional public schools (M = 4.76, SD = 1.04) is significantly higher (t (385) = 3.25, $p < .001$) than the scores for charter schools (M = 4.34, SD = 1.13). Therefore, a dummy variable (charter school or traditional public school) was created for use in subsequent analyses as a control when predicting teacher collaboration with school academic press.

Chapter 2 highlighted the association between the school academic press and student achievement. The schools in priority status were in the lowest 5% in student achievement. To establish the criterion-referenced validity of academic press, it was hypothesized that academic press is positively related to student achievement scores in mathematics and reading and that the academic press is significantly lower in priority schools than non-priority schools. A correlational analysis suggested that academic press was positively related to prior achievement in mathematics (r (46) = .52, $p < .001$) and reading (r (46) = .57, $p < .001$). Also, a t-test showed that the mean academic press score for priority schools (M = 3.93, SD = .60) was significantly lower (t (386) = 9.17, $p <$ .001) than the score for non-priority schools (M = 4.60, SD = .55).

Multilevel Modeling

This section will describe the teacher and school sample used for multilevel analysis. Univariate descriptive statistics and bivariate correlational analysis for teacher-level and school-level variables will be provided. The section also highlights the results of multilevel modeling starting with the results of the unconditional model where total variation in the outcome variable, teacher efficacy, is partitioned into its within- and between-school variance components. These variance estimates will also serve as the baseline for successive models. Next, the results of the model with teacher-level variables, within-school model (level-1), are presented followed by the findings of the full model where school-level variables (level-2) are also included in the model. The section will also discuss model specifications and variable selection criteria and will conclude with the estimates of the proportion of variance in teacher efficacy that was accounted by the predictor variables: teacher collaboration (TC) at level-1 and academic press (AP) at level-2.

Sample Characteristics

The data for this study were obtained from a survey of teachers in a large Midwestern urban school district. Both, traditional and charter elementary schools (K-5) from this school district participated in the study. Schools with a low response rate (3 or fewer teachers responding) were removed from the data and the multilevel analysis included only schools that completed both Forms A and B. The academic press scores were aggregated to the school level, and the final sample for multilevel analysis consisted of 383 teachers in 44 schools. The number of teachers surveyed per school ranged from a

minimum of four teachers (5 schools) to a maximum of 22 teachers (1 school), and the average number of teachers surveyed per school was 8.7 (Table 4.11).

Table 4.11 *Teacher Sample (n = 383)*

Teacher, N	Mean	Std. Dev	Minimum	Maximum
383	8.7	3.8	4	22

Among the 44 urban schools surveyed, eight schools were charter schools operating in the urban district boundaries. Also, ten of the 45 urban schools were in priority status (student academic achievement ranks in the lowest 5% in the state). Table 4.12 displays the number of teachers surveyed and the number of students enrolled during the 2016-17 school year.

Table 4.12 *School Sample (n = 44)*

	Type of school		School status	
	Traditional Public School	Charter School	Priority	Non-Priority
Number of schools	36	8	10	34
Number of Teachers surveyed	298	85	72	311
Enrollment of students (2016)	14516	2820	3016	14320

Teacher-level Variables

Three hundred eighty-three elementary school teachers from 44 urban schools responded to items in teacher efficacy and teacher collaboration scales. Teachers evaluated the items by using a 6-point Likert scale ranging from 1 to 6, where 1, indicated the respondent *strongly disagrees*, and 6 indicated the respondent *strongly agrees*. Table 4.13 summarizes the descriptive statistics for teacher collaboration (M = 4.66, SD = 1.08) and teacher efficacy (M = 4.56, SD = 0.84). Though the average score of the two variables is similar, teacher collaboration scores had a greater variation. For both teacher collaboration score (Mdn = 5.0) and teacher efficacy (Mdn = 4.75) scores, the median score is greater than the mean leading to a skewed distribution as also shown by the negative value of skewness. These values are in the acceptable range of -1.0 to +1.0;

hence one can assume that the distribution of teacher collaboration and teacher efficacy scores is normal.

Table 4.13 *Descriptive Statistics for Teacher Collaboration and Teacher Efficacy (n = 383)*

	M	*SD*	Skewness	Kurtosis
Teacher Collaboration	4.66	1.08	-0.80	0.21
Teacher Efficacy	4.56	0.84	-0.71	0.68

Teachers also provided demographic information about ethnicity, gender, total years of teaching, years teaching at the current building, and educational levels. Table 4.14 highlights the sample composition and teacher demographics. Of the 383 teachers surveyed, a majority (80.7%) were females. The ethnicity variable was decomposed to a dichotomous variable representing 72.6% of teachers as white and 19.7% as non-white. Though more than a third of the teachers surveyed (39.7%) have taught for a total of 0-9 years, a majority of teachers surveyed (56.3%) have been teaching in the current building for less than three years. The teachers surveyed were highly qualified as more than half of the teachers had earned a post-baccalaureate degree. Furthermore, traditional public-school teachers surveyed were much more likely to have a master's degree than their counterparts in charter schools. These values are comparable to the teacher demographic information obtained from the state namely: 75.1% teachers are female, 92.5% are white,

49% have been teaching for 0-9 years, and 63% had a masters or higher degree (Ohio Department of Education, 2016a)

Table 4.14 *Teacher Demographic Variables (n = 383)*

Demographic Variable	Frequency	%
Gender		
Male	55	14.4
Female	309	80.7
Unreported	19	5.0
Ethnicity		
White	278	72.6
Non-White	75	19.7
Unreported	30	7.7
Total Years of Teaching Experience		
0-3	65	17.0
4-9	87	22.7
10-16	81	21.1
17-25	84	21.9
26 +	51	13.3
Unreported	15	3.9
Total Years at Current Building		
0-3	206	56.3
4-9	96	26.2
10-16	40	10.9
17-25	22	6.0
26 +	2	0.5
Unreported	17	4.4
Education Level		
< BA	5	1.3
BA	132	34.5
MA	214	55.9
EdS	7	1.8
PhD/EdD	6	1.6
Unreported	19	5.0

The correlations between all teacher-level variables are depicted in Table 4.15. Mainly, a statistically significant positive correlation was observed between teacher efficacy and teacher collaboration ($r(395) = .25$, $p < .01$) and teacher collaboration was positively and significantly related to total years teaching ($r(370) = .18$, $p < .01$) and negatively correlated to educational levels ($r(382) = -.02$, $p = .826$), though the latter correlation is not statistically significant.

Table 4.15 *Correlations among Teacher-level Variables (n = 383)*

Teacher-level Variables	1	2	3	4	5	6	7
1. Gender	1						
2. Ethnicity	-.06	1					
3. Total years teaching	-.03	-.04	1				
4. Years teaching in current building	-.07	-.04	.49**	1			
5. Education level	.11*	.08	.39**	.17**	1		
6. Teacher collaboration score (TC)	.01	.05	.18**	.03	-.02	1	
7. Teacher efficacy score (TE)	-.02	.03	.07	-.001	.02	.25**	1

* Correlation significant at 0.05 level (2-tailed)
** Correlation significant at 0.01 level (2-tailed)

School-level Variables

As academic press is a school-level construct, teacher responses on items from academic press scale were aggregated at the school-level to produce school-level academic press. For 44 elementary schools used in the analysis, the academic press score ranged from 3.13 to 5.86 with a mean score of 4.42 (*SD* = 0.63) and slightly negative skewness (skewness = .21). The schools provided information about various school-level contextual variables for the school year 2016-17. Table 4.16 highlights the descriptive statistics for school-level variables. As evident, the sample of urban elementary schools used in the analysis served an average of 394 students, and in these 44 schools, the majority of students are non-white (77.9%) and economically disadvantaged (97.2%). According to the state department of education, the school district had one of the lowest rankings and was classified as urban, and very high poverty. In similar urban schools in the state, 84.1% of students were economically disadvantaged, 62.7% were considered minority and 7.6% of students were classified as gifted (Ohio Department of Education, 2016a).

Table 4.16 *School-level Descriptive Statistics (n = 44)*

	M	*SD*	Minimum	Maximum
Total School Enrollment	394	127.0	165	733
Percent of students considered economically disadvantaged	97.2	10.6	44	100
Percent of minority (non-white) students	77.9	22.7	19	99
Percent of students considered mobile	19.0	7.6	4.4	31.7
Percent of gifted students	6.3	8.2	0.0	48.0
Prior Math achievement (fifth grade math scores in 2015)	686.0	21.2	656.6	763.4
Prior Reading Achievement (fifth grade reading scores in 2015)	653.8	21.3	653.8	758.9
Academic Press Score (AP)	4.42	.63	3.13	5.86

To establish the association between continuous school-level variables, a bivariate correlation analysis was performed (Table 4.17). There were significant positive correlations between the academic press and prior achievement in math (r (42) = .50, p < .01) and reading (r (42) = .57, p < .01), and between academic press and percent gifted students (r (42) = .42, p < .01). A significant negative correlation was observed between school academic press and percent of minority students (r (42) = -.54, p < .01), and academic press and percent mobile students (r (42) = -.36, p < .01).

Table 4.17 *Correlations between School-level Variables (n = 44)*

	1	2	3	4	5	6	7	8
1. Total Enrollment	1							
2. % Gifted Students	.15	1						
3. % Econ. Disadvantaged	-.14	.21	1					
4. % Mobile Students	-.25	-.48**	.16	1				
5. % Minority Students	-.04	-.64**	.20	.39**	1			
6. Prior Math Achievement	.31*	.56**	-.44**	-.52**	-.67**			
7. Prior Reading Achievement	.32*	.63**	-.37*	-.50**	-.71**	.93**	1	
8. Academic Press	.27	.42**	-.21	-.36*	-.54**	.50**	.52**	1

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Before proceeding with multilevel analysis, teacher and school-level variables were tested for assumptions of statistical tests. Partial regression plots and a plot of studentized residuals against the predicted values showed linearity. Durbin-Watson statistic of 1.88 indicated the independence of residuals. The plots of studentized residuals vs. unstandardized predicted values indicated homoscedasticity of variance. Tolerance values were greater than 0.1 and VIF values were less than ten suggested that there was no multicollinearity. The standard residual analysis showed that the data contained no outliers (Std. Residual Min = -3.81, Std. Residual Max = 2.5). Also, there were no studentized deleted residuals greater than ±3 standard deviations, no leverage

values greater than 0.2, and values for Cook's distance above 1, further indicating the absence of outliers. However, Q-Q Plots and skewness values indicated that the assumption of normality was on the borderline.

Unconditional Model

The unconditional model (or null model) provided information about the amount of variance in teacher efficacy (outcome) that lies within and between 44 schools sampled in this study. Table 4.18 summarizes the results of the unconditional model. Across all schools, the overall average school mean teacher efficacy score is statistically different from zero ($\gamma_{00} = 4.55$, t (43) = 75.6, $p < .001$). The total variability in teacher efficacy ($\tau_{00} + \sigma^2$) as partitioned by this empty model was 0.707 and the variance of teacher efficacy between schools was statistically significant (τ_{00} = var (u_{0j}) = .080, χ^2 (43) = 91.00, $p < .001$). The proportion of variance between schools, as measured by the intraclass correlation, is also significant and suggests that 11.3% of the total variance in teacher efficacy could be attributed to schools. The results of the unconditional model inform that a multilevel model is necessary to examine this variation in teacher efficacy scores. In further models, teacher-level and school-level variables were added to try to reduce the variation within schools (σ^2) and to explain between-school differences (τ_{00}). The unconditional model also provides model fitting criteria like deviance statistics and index comparisons such as AIC and BIC that can be used during model selection to gauge improvement in the model fit. For this baseline or null model, Table 4.23 summarizes the model fit measures.

Table 4.18 *Unconditional Model Characteristics: Variations between Schools in Teacher Efficacy: Model 1 (n = 383 teachers in 44 schools)*

	Teacher Efficacy
Intercept (school average, γ_{00})	4.55
Between-school variance (τ_{00})	.080
Within-school variance (σ^2)	.627
Proportion of variance between schools (ICC)	.113

χ^2 (43) = 91.00, p < .001

Within Schools Models

To the unconditional model, teacher-level variables (demographics and teacher collaboration) were added in a step-wise procedure. All teacher-level variables were grand mean centered and treated as fixed effects i.e., effects of the variable are same across schools. In the final model, only variables that were statistically significant were retained. Table 4.19 presents the results for statistically non-significant teacher demographic variables. As depicted, various teacher-level demographic variables are unable to significantly account for the observed variation in teacher efficacy belief scores. It was observed that the only statistically significant teacher-level predictor of teacher efficacy beliefs was teacher collaboration and unlike the non-significant demographic variables, the addition of teacher collaboration reduced unexplained variance in teacher efficacy beliefs at both teacher and school-levels. Furthermore, treating any of the non-significant demographic variables as a random effect produced models that failed to converge.

Table 4.19 *Multilevel Analysis of the Effect of Teacher-level Demographic Variables on Teacher Efficacy (n = 383 teachers in 44 schools)*

	Fixed Effects				Random Effects	
	Coefficient	SE	*t ratio*	*p-value*	Between-school variance, τ_{00}	Within-school variance, σ^2
Gender	-0.073	.12	-.608	.544	.071	.632
Ethnicity	.019	.04	.485	.628	.057	.628
Total years teaching	.049	.04	1.44	.151	.081	.627
Years teaching in current building	.030	.05	.632	.528	.069	.622
Education level	.057	.07	.823	.411	.075	.615

To propose a parsimonious and stable model that accounts for the variance in teacher efficacy scores, only the statistically significant predictor (teacher collaboration) was retained. In this regard, two models were explored: Model 2A that treated teacher collaboration slopes as fixed across schools and Model 2B that allowed for the values of teacher collaboration slopes to be random across schools. Table 4.20 highlights the teacher-level model with the coefficient (slopes) of teacher collaboration as fixed (upper half of the Table 4.20, Model 2A) or random (lower half of the Table 4.20, Model 2B). In both models, teacher collaboration was significantly related to teacher efficacy within schools. As previously mentioned in Chapter 3, it was assumed that slopes of teacher

collaboration would be varying between schools as in Model 2B. The comparison of Models 2A and 2B with the unconditional model (Table 4.23) showed that percent change in variance and model fit measures are more superior for Model 2B (treating slopes as random) than Model 2A (treating slopes as fixed). Therefore, Model 2B was retained for further analysis.

In Model 2B it was observed that on average, teacher collaboration is positively and significantly related to teacher efficacy within schools and a unit increase in teacher collaboration score is associated with an increase of 0.20 units of teacher efficacy (t (43) = 3.66, $p < .001$). Stated another way, a one standard deviation increase in teacher collaboration is associated with a .25 standard deviation increase in teacher efficacy. After including teacher collaboration as a predictor of teacher efficacy, within-school variability in teacher efficacy scores was reduced by 12% and between-school variability was reduced by 31%. However, statistically significant differences (variability) in school means of teacher efficacy still existed. There was also statistically significant variation between schools in the effect of teacher collaboration (i.e., slopes) (τ_{11} = Var(u_1) = .053, $\chi^2(43) = 74.3$, $p < .005$). The unexplained variance in teacher efficacy beliefs between schools might decrease by incorporating school-level variables in the full model.

Table 4.20 *Multilevel Analysis of the Effect of Teacher Collaboration on Teacher Efficacy: Model 2A and 2B (n = 383 teachers in 44 schools)*

Slope of Teacher Collaboration Fixed (Model 2A)				
	Fixed Effects			
	Coefficient	SE	*t-ratio*	*p*
Intercept (TE)	4.55	.056	80.60	<.001
Teacher Collaboration	.183	.040	4.67	<.001
	Random effects			
	Variance	*df*	χ^2	*p*
Between-school variability (τ_{00})	.0643	43	83.42	<.001
Within-school variability (σ^2)	.602			

Slope of Teacher Collaboration Random (Model 2B)				
	Fixed Effects			
	Coefficient	SE	*t-ratio*	*p*
Intercept (TE)	4.53	.054	83.07	<.001
Teacher Collaboration	.198	.054	3.66	<.001
	Random effects			
	Variance	*df*	χ^2	*p*
Between-school variability (intercept) (τ_{00})	.055	43	74.06	<.005
Between-school variability (TC slope) (τ_{11})	.053	43	74.31	<.005
Within-school variability (σ^2)	0.552			

Full Model

To build the full model, school-level variables were added to Model 2B one at a time, starting with the school contextual variables. In the final model, only variables that were statistically significant were retained. Table 4.21 shows the results for these

intermediate models that include school contextual variables. When entered individually both prior reading and math achievement were statistically significant albeit the value of the coefficient was only 0.004 and 0.005, respectively. However, when entered in conjunction with academic press, neither prior math nor prior reading was statistically significant. It was observed that the only statistically significant school-level variable was academic press and unlike the non-significant contextual variables, the addition of the school academic press reduced the variance and produced a better model fit.

Results from Model 3A (teacher collaboration at level-1 and academic press at level-2 predicting within- and between-school variance in teacher efficacy beliefs) are depicted in Table 4.22 and indicate that a unit increase in school academic press is related to about quarter-point increase in teacher efficacy. In other words, a one standard deviation increase in academic press is associated with a .20 standard deviation increase in teacher efficacy. Academic press predicts differences among schools in teacher efficacy beliefs (γ_{01} = .26, p < .005) even after controlling for individual teacher collaboration within schools. The estimates of variance components suggest that teacher collaboration and academic press reduce the between-school variance by more than 50% (.080 in the null model to .037 in model 3A) and reduce within-school variance by about 12% (from .627 in the null model to .549 in model 3A). Moreover, teacher efficacy belief slope variance (τ_{11}= .053) is still significant (χ^2 (43) = 74.1, p < .005), suggesting that the relation between teacher collaboration and teacher efficacy varied across schools in the sample.

Table 4.21 *Multilevel Analysis of the Effect of School-Level Contextual Variables on Teacher Efficacy (n = 383 teachers in 44 schools)*

	Fixed Effects				Random Effects	
	Coefficient	SE	*t ratio*	*p-value*	Between-school variance, τ_{00}	Within-school variance, σ^2
TPS/ Charter	.060	.14	.434	.667	.055	.552
School Status	-.114	.13	-.851	.400	.056	.552
Total Enrollment	.006	.004	1.42	.163	.052	.553
% Gifted Students	.491	.67	.735	.467	.050	.551
% Econ. Disadvantaged	-.654	.42	-1.55	.130	.047	.552
% Mobile	-.008	.007	-1.16	.249	.056	.550
% Minority Status	-.433	.23	-1.88	.068	.057	.551
Prior Math Achievement	.004	.001	2.31	.026	.054	.551
Prior Reading Achievement	.005	.002	2.16	.037	.055	.550

To account for the variation among teacher collaboration-teacher efficacy slopes across schools, a cross-level interaction between teacher collaboration and academic press was introduced leading to Model 3B in Table 4.22. The findings of Model 3B suggested that school academic press did not moderate the within-school TC-TE slope (γ_{11} = .08, p > .05). As Model 3B contained a statistically non-significant interaction

term, this model was rejected over the more parsimonious Model 3A. Also, the addition of interaction terms in Model 3B did not alter the variance parameters from Model 3A and produced model fit statistics that were inferior to Model 3A. Hence, Model 3A was considered the final full model that can be used to explain the variability in teacher efficacy within and between schools

Table 4.22 *Multilevel Analysis of the Effect of Teacher Collaboration and School Academic Press on Teacher Efficacy: Model 3A and 3B (n = 383 teachers in 44 schools)*

Parameter	Model 3A		Model 3B	
	Parameter estimate	*p-value*	Parameter estimate	*p-value*
Fixed effects				
Intercept (average TE), γ_{00}	4.53 (.05)	<.001	4.52 (.05)	<.001
TC, γ_{10}	.18 (.05)	.002	.18 (.05)	.002
AP, γ_{01}	.26 (.08)	.003	.25 (.08)	.005
AP *TC, γ_{11}			.08 (.09)	.392
Variance estimates				
Within-school variance, σ^2	.549		.549	
Between-school Variance, τ_{00}	.037[a]		.037[c]	
Slope Variance, τ_{11}	.053[b]		.054[d]	

[a] χ^2 (42) = 60.9, p =.02. [b] χ^2(43) = 74.05, p =.003.
[c] χ^2(42) = 60.9, p =.03. [d] χ^2 (42) = 73.4, p =.002.

Finally, to ascertain that the best-fit model is Model 3A, model fit statistics and model adequacy were analyzed (Table 4.23). Deviance statistics (ΔD) for successive models were calculated, and from Model 1 to Model 2B, change in deviance (ΔD) was 27.9. The value of ΔD is higher than the critical χ^2 value of 5.99. Thus we reject the null hypothesis that the two models fit the data equally well, and a more complex model (Model 2B) was selected over the null model. Similarly, Model 3A (deviance = 901.7) is a better fit than the null model and had lower deviance than Model 2A. Therefore, one can conclude that Model 3A (full model) with teacher collaboration and academic press as predictors of teacher efficacy is a better fit than the unconditional or within-school models.

Table 4.23 *Model Fit Measures for All Models*

	Model 1 (baseline)	Model 2A (+TC fixed)	Model 2B (+TC random)	Model 3A (2B + AP)	Model 3B (3A+ TC*AP)
% reduction in variance-level-1		4	12	12.4	12.4
% reduction in variance-level-2		19.7	31.3	53.6	53.6
Deviance	937.6	919.6	909.7	901.7	905.7
AIC	941.6	927.6	917.7	909.7	913.7
BIC (n= no. level-2 units)	945.2	927.4	917.4	909.4	913.4
BIC (n= no. level-1 units)	947.4	929.4	919.5	911.5	915.5
Number of parameters	2	4	4	4	4

From Table 4.23 it is evident that the full model (Model 3A) with teacher collaboration and academic press as predictors explained more than half of the variation (53.6%) between schools in teacher efficacy. However, the chi-square statistics is still significant suggesting that unexplained variance is non-zero and that other school characteristics might explain the between-school differences in teacher efficacy not associated with academic press.

Chapter 5. Discussion

In this chapter, the results of the study are discussed. A summary of major findings of the study is followed by an interpretation of the findings including a description of the setting of the study and explanation of results of exploratory factor analysis (EFA) and multilevel modeling (HLM). These results are analyzed in light of the findings of past researchers. After discussing the results, an evaluation of the study is provided. The last section focuses on the implications of the findings and recommendations for future research.

Summary of Findings

The current study on the relationship between the triad of variables: teacher efficacy, teacher collaboration, and school academic press, led to some noteworthy findings:

1. There is a significant statistical difference in teacher efficacy within and between the urban schools studied; specifically, 11.3% of the variation in teacher efficacy can be attributed to the schools.
2. The teacher demographic variables (that were used as a control) are statistically unrelated to teacher efficacy. However, teacher collaboration is a significant predictor of the variance in teacher efficacy. A one standard deviation increase in

teacher collaboration is associated with a .25 standard deviation increase in teacher efficacy.

3. The within-school model with teacher collaboration accounts for almost one-third of between-school variability in teacher efficacy.
4. There is a statistically significant variance in slopes of teacher collaboration indicating that the relationship between teacher collaboration and teacher efficacy vary significantly across the schools, but contextual variables or academic press did not affect the slope.
5. The school-level contextual variables are statistically unrelated to teacher efficacy. In contrast, school academic press is positively and significantly related to teacher efficacy; a one standard deviation increase in school academic press is related to a .20 standard deviation increase in teacher efficacy.
6. More than 50% of between-school variability in teacher efficacy scores can be explained by teacher collaboration and academic press. That also means that other school-level factors might be at play to explain the rest of the variance.
7. The three scales used in the study: teacher efficacy scale, teacher collaboration scale, and academic press scale are reliable and valid.
8. To conceptualize the relationship between teacher efficacy, teacher collaboration, and the school academic press the current study utilized Bandura's social cognitive theory. The conceptual framework proposed a mechanism for the influence of the school academic press and teacher collaboration on teacher efficacy via the tetrad of sources of efficacy beliefs. The present study adds more credence for the

mechanism. Nevertheless, more needs to be explored and will be discussed later in this chapter.

Sample and the Setting

The present study was conducted using a convenience sample of elementary school teachers from an urban city in the Midwestern United States. Most schools sampled in the study were operated by a school district (traditional public schools, 82%) and the rest were elementary charter schools operating in the urban city limits. More than one-fifth of the schools were classified as priority schools by the state as the students in these schools had achievement scores in the lowest 5% in the state. The sample's average reading and mathematics scores were below the state minimum of 700 points. Moreover, this was only the second-year schools had used the new state-mandated, computer-generated assessment. These scores were used as a proxy for prior student achievement in this study. This new assessment was much different from the previously used paper-pencil assessment.

The elementary schools sampled in the study had an average enrollment of about 400 students and were overwhelmingly composed of minority students (78%) and economically disadvantaged students (95%, as calculated by the number of free and reduced lunches served by the schools). Lastly, the school district used in the study was going through a chaotic phase with a change in leadership at the school board, district, and school levels. There was an ongoing state investigation about the conduct of district and school leaders that added to the chaos.

A sample of 383 teachers from 44 elementary schools was used for multilevel analysis. From Table 4.14 it is evident that more than three-quarters (78%) of teachers were from traditional public schools and about a fifth (19%) worked in the priority schools (lowest performing schools in the state). The sample of teachers surveyed was mostly white (73%), female (81%) and had a bachelor's degree or higher (90%). Though 82.5% surveyed had worked for nine years or less, the majority of the teachers (56.3%) surveyed had been working for three years or less at the current building. Chapter 4 compared these statistics with the state level data.

Discussion of Factor Analysis Results

The teacher efficacy scale used in the study has previously been used by Goddard et al. (2018, 2015 and 2001). Using exploratory factor analysis, one factor with an eigenvalue of 2.27 explaining 56.8% of the total variance is extracted. This single factor has factor loadings ranging from .59 to .70 and a reliability coefficient of .74. The reliability of the scale is similar to the reliability of the scale when used in previous research (e.g., 0.74 in Goddard and Kim (2018); 0.74 in (R. D. Goddard et al., 2015); 0.79 in Goddard and Goddard (2001); 0.77 in Hoy and Woolfolk (1993); and 0.82 in Woolfolk and Hoy (1990)). Recently, Goddard et al. (2018) used the same four-item scale with teachers serving high poverty, rural schools and obtained factor loadings of .68 to .80. More importantly, the values of factor loadings and mean teacher efficacy scores obtained in this study (M = 4.56, SD = .84) are similar to values obtained by Goddard and Goddard (2001) (M = 4.66, SD = .77) using a similar sample of urban teachers serving poor, minority students with slightly below average achievement. Chapter 2 discussed the

measurement dilemmas and psychometric infirmities associated with teacher efficacy scales. Consequently, such comparisons of the psychometric properties of the teacher efficacy scale are essential and show that the teacher efficacy scale is used in the present study is reliable and valid.

Righter (2017) developed the five-item teacher collaboration scale used in this study and the items mirrored the 5-step process teachers followed in teacher-based teams (TBTs) as part of the state-wide teacher collaboration model. Teachers met once a week to collaborate on teaching and instruction. The scale gathers individual teacher's perception about collaboration in their TBT's and has the reliability of .93. All five items have excellent loadings (.66 to .81), and the single factor solution explains 77% of the variance in the items analyzed. The teacher collaboration scale used in the study is new, specific, contextual and has high reliability. When compared to other collaboration scales (R. D. Goddard et al., 2015; Goddard et al., 2007; Goddard & Kim, 2018; Goddard, 2010; Miller et al., 2010; Ostovar-Nameghi & Sheikhahmadi, 2016) it can be said that the teacher collaboration scale used in this study reflect items soliciting individual teacher's perception about the level of formal, instruction-focused collaboration that is occurring in their teams.

Chapter 2 summarized the genesis of academic press variable from the strand of organizational health inventory (Hoy & Fedman, 1987). Barring a few alterations to the wordings of the items, academic press scales have been consistent about the dimensions of the academic press: orderly learning environment, rigor, mastery, accountability, and high expectations (Berebitsky, 2010; Eubanks, 2012; Murphy et al., 1982; Phillips, 1997;

Shouse, 1996). The school academic press scale used in this study emulates these critical dimensions of the academic press. The items are worded to solicit teacher's perception of group-referent capability (Goddard & LoGerfo, 2007); thus teacher responses are rightly aggregated to the school-level to construct a school-level academic press scale. The original nine-item scale has three items focusing on each dimension. During the initial exploratory factor analysis, a two-factor solution that explains 65.6% of the total variance is obtained. In this two-factor solution, four items cross-load and the eigenvalue of the second factor (1.01) is just above the Kaiser criteria cut-off of 1.0 (Table 4.11). An iterative process is used to identify item 2 as responsible for cross loading and the second factor.

Further, Item 2 suffers from psychometric infirmities: poor correlations with other items, weak communalities, and low factor loadings. It is suspected that the wording of item 2 (*In this school classroom disruptions are infrequent*) could have been a source of confusion for respondents. In the past, a one-factor solution for the academic press scale has been well documented and accepted, and there was no cause in this study to propose otherwise. Hence, the exploratory factor analysis was performed sans item 2.

The factor analysis of the eight-item academic press scale provides a single factor that accounts for 56% of the total variance, item loadings ranging from .56 to .78 (Table 4.12) and had a reliability of .89. Using items that reflect similar dimensions for school academic press, researchers have reported similar reliabilities (e.g., .94 in McGuigan and Hoy (2006); .92 in Goddard, Sweetland, et al. (2000); .89 in Gray et al. (2016); and .72 in

Hoy and Woolfolk (1993)). Lastly, as shown in chapter 4, the scale for each variable is reliable and valid.

Discussion of Multilevel Analysis Results

A multilevel modeling approach is used to analyze the variation in teacher efficacy within-and between-schools. Three models are built to investigate if the teacher and school-level variables account for the variance in teacher efficacy. This section will discuss the results of the three models: the unconditional model, the within-school model, and the full model. Results of each model will be compared with results from linkage studies discussed in Chapter 2.

Unconditional Model

The unconditional, or null model, is used as a baseline model to answer the first research question: Does the mean teacher efficacy scores varied within and between schools? The total variance in mean teacher efficacy scores is partitioned to its within- and between-school components. Table 4.18 summarizes the results of the unconditional model. A significant result in the chi-square test indicates that variation does exist within and between schools in teacher efficacy scores. In the urban teachers surveyed for this study, 11.3% of the variability in teacher efficacy can be attributed to schools, i.e., there exists a substantial variability between schools in teacher efficacy and further analysis is warranted. Within-school model and full model are proposed to explore if teacher-level variables (demographic and teacher collaboration) and school-level variables (contextual and academic press) can account for this variability.

Interestingly, the sample of urban teachers surveyed in the current study shows more variation in their teaching efficacy beliefs as compared to urban samples surveyed by Goddard and Goddard (2001) and Goddard and Kim (2018). Using same teacher efficacy scale with similar teacher demographic and similar school context, Goddard, and Goddard (2001) observed a teacher efficacy variation of 5% and Goddard and Kim (2018) reported a variation of 3% in teacher efficacy due to differences between schools. Perhaps, the greater variability in teacher efficacy in the current study might be attributed to the outlier status of the sample.

Within Schools Model

Within-school, or teacher-level, model is built to examine if teacher-level variables (demographic and teacher collaboration) can account for the variability in teacher efficacy scores. To the unconditional model, teacher demographic variables are added as a control. As expected, none of the demographic variables are significantly associated with teacher efficacy. Results from the within-school model are depicted in Table 4.20 and confirm that teacher collaboration is positively and significantly related to teacher efficacy. After controlling for teacher-level demographic variables, a one standard deviation increase in teacher collaboration is associated with a .25 standard deviation increase in teacher efficacy. The study also shows that there is a significant variance between schools in the strength of the relationship between teacher collaboration and teacher efficacy (teacher collaboration slopes).

The within-school model is also used to calculate the reduction in, within- and between- school variance in teacher efficacy scores due to the addition of teacher-level variables. For this study, compared to the unconditional model, the within-school model explains 12% variance at teacher-level and 31% variance at the school level. In other words, one-third of the variation in mean teacher efficacy across schools can be attributed to differences in collaboration between teachers in these schools. However, statistically significant variation remains in teacher efficacy, and the full model might explain the remaining variability.

The strength of the relationship between teacher efficacy and teacher collaboration reported in this study is comparable to the strength reported by previous researchers. Goddard and Kim (2018) in a study with rural high poverty schools in the United States observed small, significant indirect effect between teacher collaboration and teacher efficacy (β = .16, p < .001) and a small significant relationship between teacher efficacy and years of experience (β = .04, p < .10). Sehgal et al. (2016) used the data from private secondary schools in India and observed that collaboration was positively associated with teacher efficacy (β = .26, p < .001) and also reported the non-significant relationship between teacher efficacy and teacher demographic variables like age, qualification, and experience. Duyar and Gumus (2013), used slightly different scales in Turkish schools and reported that collaboration was the strongest predictor of teacher efficacy (β = .37, p < .01) and similar to Goddard and Kim (2018), Duyar et al. also reported a small but significant influence of teacher experience (β = .07, p < .01) on teacher efficacy. Likewise, Collie et al. (2012) observed that Canadian suburban

elementary teacher's perception of the level of collaboration was positively associated with teacher efficacy (β = .09, p < .05).

No clear consensus emerges in research about the relationship of demographic variables with teacher efficacy but whatever significant association they might have tends to be weak or fluctuates. For example, Hoy et al. (1993) reported a significant and positive association between teacher education level and teacher efficacy (β = .19, p < .05). However, over the last 20 years, the association between teacher qualification and teacher efficacy has diminished, possibly as more teachers hold graduate degrees than in the past. Thus, the range of variability in teacher qualification variable is reduced, and the analysis fails to detect if any relationship exists between educational level and teacher efficacy. In most studies, demographic variables tend to have a non-significant or very weak significant association. In this regard, the results of the study are in keeping with traditions, and it can be seen that irrespective of teacher demographic variables such as gender, years of teaching, and educational qualifications, teacher collaboration is positively and significantly associated with teacher efficacy. Moreover, the sample of teachers used in the study is homogenous in terms of demographic variables and the range in demographic variables is limited. This further reduces the chances of detecting any relationship between teacher efficacy and demographic variables.

Full Model

In the full model, school-level contextual variables are added to the within-school model. None of the school-level contextual controls have a significant association with teacher efficacy. Nonetheless, the school academic press is a significant predictor of teacher efficacy. Stated otherwise, variance in academic press of the school explains variance in teacher efficacy above and beyond school contextual variables such as prior achievement or percent students considered economically disadvantaged. A one standard deviation increase in the school academic press is associated with a .20-standard deviation increase in teacher efficacy (Table 4.22). Compared to the unconditional model the full model includes only statistically significant teacher and school-level variables, and the full model reduces the variance component at the school-level substantially. The full model explains more than 50% of the between-school variance and 12% of the within-school variance in teacher efficacy.

These results of the full model are consistent with Hoy et al. (1993) report of .19-standard deviation increase in teacher efficacy upon a one-unit standard deviation increase in the academic press. Surprisingly, the observed strength of the relationship in the current study and Hoy et al. (1993) study are comparable. Though the current study employs multilevel modeling to account for aggregation bias, it is conducted in schools that can be outliers: urban, chaotic, poor, low SES, and low achievement scores. On the other hand, Hoy et al. (1993) used regression methods on the sample that consisted of teachers working in districts that were above average in wealth and achievement. In two distinct settings, somewhat similar values of the association between school academic

press and teacher efficacy might demonstrate that the strength of the normative influence of academic press is independent of the type of the school and the setting. These results also speak volumes about the potency of the normative influence of academic press that despite the chaos of the school district and stress about the new state assessments, an environment of high academic press never ceases to influence teacher's efficacy beliefs about their teaching capabilities. The next section will explore some alternate possibilities that might also explain these results.

In the final model (Model 3B, Table 4.22) a cross-level interaction effect between academic press and teacher collaboration is added to explore if the interaction between teacher collaboration and academic press explains the variation in the slope of the relationship between teacher collaboration and teacher efficacy. The addition of the cross-level term did little to explain the between-school differences in teacher efficacy; i.e., school academic press did not moderate the within-school teacher collaboration-teacher efficacy slope. Therefore, teacher collaboration has different influences across schools, and further study is needed to explore school-level variables that mediate the relationship. Though the finding of the significant slope was intriguing, the association between teacher collaboration slopes and the academic press was not the focus of this study. Moreover, slopes tend to be a less reliable estimate than the intercepts, and the lower reliability can weaken the power to detect level-2 relationships that may explain the variation in slopes (Heck et al., 2013; Raudenbush & Bryk, 2002).

Implications for Future Research

Though teacher collaboration and school academic press account for about half of the variation in teacher efficacy, other school-level variables might be at play to account for the remaining between-school variation in teacher efficacy. Goddard and Goddard (2001), argued that the sources of efficacy operated at both individual and collective level and proposed that collective efficacy predicts variations in teacher efficacy above and beyond the variance explained by school contextual factors such as student achievement and socioeconomic status. It is yet to be seen what effect adding collective efficacy would have in this study. As collective efficacy and academic press are highly collinear, multicollinearity might pose problems in such analysis. Therefore, one can either enter school variables one at a time or use multilevel structural equational modeling that can withstand and account for collinearity issues.

Also, school's academic emphasis has been known to strongly correlate with the duo of collective trust in staff and students as well as collective efficacy to form a second-order construct called academic optimism which is a powerful predictor of student achievement irrespective of student SES (Hoy, Tarter, & Hoy, 2006). Similarly, Beard et al. (2008) isolated a teacher-level construct called teacher academic optimism consisting of teacher trust in students and staff, teacher efficacy, and teacher academic emphasis. Therefore, regardless of the level of analysis, trust plays an active role in teacher and school-level relationships (Goddard et al., 2001). Rightly so, one cannot expect teachers to collaborate and successfully work together if there is a lack of trust between them (Gray et al., 2016; Hallam, Smith, Hite, Hite, & Wilcox, 2015). For the

current study, it is yet to be seen if adding faculty trust (as a school-level variable) can account for between-school variance in teacher efficacy.

Teacher collaboration has moved away from the one-stop shop model (Darling-Hammond, 1994) to the presently used structured model of formal collaboration that is focused on improving instruction (Goddard & Kim, 2018; Goddard, 2010; Righter, 2017). In some schools collaboration, whether in teacher-based teams or professional learning communities, is not a choice but a norm. Collaboration is the new star in the constellation of variables just as teacher efficacy and academic press that have an impact on student achievement and teacher beliefs. In this regard, the variable of teacher collaboration needs to undergo the strict rigor of research and scholarship similar to teacher efficacy and academic press that was highlighted in Chapter 2.

Goddard's (2018) proposal of three dimensions of teacher collaboration (formal, informal, and collaboration on instructional policy) is a step in the right direction but more, needs to be done. Clarity is lacking about what is being measured- teachers' beliefs about their level of collaboration (teacher-level) or teachers' beliefs about the level of collaboration in schools (school-level). The statements of the items need to reflect the self-referent or group-referent perception that is being measured. The statistical methods used also need to account for the aggregation bias and unit of analysis issues that may arise. Variables like teacher efficacy, collective efficacy, school academic press, and teacher academic press have undergone the rigor mentioned above (Beard, 2008; Beard et al., 2010; Goddard, 2001; Goddard & LoGerfo, 2007; Goddard, Sweetland, et al., 2000). That cannot be said for teacher collaboration as there is still a paucity of research.

Another aspect of collaboration that offers promising prospects has to do with the team configurations used in teacher collaboration. From sociological and statistical perspectives, formal, all year teams represent a three-level hierarchy: teachers (level-1) nested within TBTs (level-2) nested within schools (level-3). Teachers are spending more and more time in small teams, that start to develop their own characteristics, thereby adding another hierarchy to the structure. This opens new vistas to explore multilevel relationships. Multilevel modeling has a rich history in sociology to study individual and group relations (Snijders & Bosker, 2012), but its use in educational data is still not a norm. Three level multilevel models in educational data have been limited to studying nesting of students in classrooms in the schools or using growth as one of the levels (Raudenbush & Bryk, 2002). Formal, structured teacher collaboration when conceptualized appropriately and studied as a three-level model offers prospects to explain better the team level characteristics that influence teacher efficacy.

Significance of the Study

Social cognitive theory operates at two levels (self and society) and serves as a perfect lens to observe concepts that operate at multiple levels. In the present study, social cognitive theory was employed to conceptualize associations between teacher efficacy beliefs (teacher-level outcome), teacher collaboration (teacher-level predictor), and school academic press (school-level predictor). In the current study, various steps were undertaken to achieve a parsimonious model viz. proper self-referent and group-referent scales were used to measure the three variables, and multilevel modeling was employed to account for nesting of the data. These actions helped in reducing ecological

fallacies, aggregation bias, and self vs. group referent bias that can stymie multilevel relationships (Raudenbush & Bryk, 2002).

When used in schools, social cognitive theory contends that there are four sources of teacher efficacy: mastery learning experience, vicarious learning experience, social persuasion, and physiological reactions (Bandura, 1999). This study proposed that the school academic press and teacher collaboration may influence teacher efficacy beliefs via one or more of these sources. Teacher collaboration offers not only experiences for vicarious learning, and occasions for social persuasion for teachers, but also the formal nature of teacher collaboration adds mastery learning experience. School academic press has long been recognized as the normative environment of the school operating via social persuasions and social norms (Goddard, Sweetland, et al., 2000). However, past studies exploring the association between the three variables are lacking.

In this study, more than 50% of the variation in teacher efficacy was explained by teacher collaboration and school academic press. Teacher demographic variables and school contextual variables such as demographic and socioeconomic makeup were not significantly related to teacher efficacy. More so schools sampled in the current study represented the lowest performing schools serving some of the poorest of the poor urban students. However, despite the outlier status of the schools some of the associations documented in the study are comparable to associations observed in varied settings. The fact that the results obtained in the current study are consistent with associations reported by other researchers suggests that teacher efficacy, teacher collaboration, and school academic press have a positive, significant, and omnipresent association. The potency of

this association is observable whether the setting is urban or rural, whether the school is public or private, whether the students are rich or poor, or whether the environment is calm or chaotic.

The results of the study are of vital importance for urban school leaders, especially those leading low performing schools that serve the poorest of the poor (i.e., schools that are in the direst need of efficacious teachers). Any influence of a school leader on student achievement is indirect and is mediated by the teacher (Leithwood & Sun, 2018). A less efficacious teacher tends to have low student achievement scores, report higher levels of stress, and are prone to change schools or leave the profession (Nathaniel et al., 2016; Skaalvik & Skaalvik, 2017; Yeo et al., 2008). Any of these can erode all the hard work and resources that the leader has invested in the classroom.

This study offers one of the several pathways that a leader can follow to help in altering teacher efficacy beliefs: creating a school environment that emphasizes academics and fosters teacher collaboration. To do so, a starting point is implementing school and classroom level policies and procedures that convey that the school is serious about teaching and learning and that it holds high expectations of conduct and behavior from all of its members.

Professional development of the staff is also a responsibility of the school leader. For this purpose, teacher collaboration focused on pedagogy particularly formal and structured collaboration in TBTs is a fertile ground for teachers to imbibe new instructional strategies that can be implemented in the classrooms. However, the pre-

requisites for effective collaboration in TBTs, structured time and resources, fall under the purview and hegemony of the leader.

Limitations

There were some limitations of the study that may restrict the generalizability of the results. Most importantly, this study was conducted using a sample of schools that can be classified as outliers: urban, high poverty, low achievement elementary schools in a school district that was undergoing chaotic changes. Although the study achieved statistical controls by utilizing only one school district, this also introduced more homogeneity in terms of teacher demographic and school contextual variables. Further research is needed to examine the relationship between teacher efficacy, teacher collaboration, and school academic press in varied settings such as non-urban or middle and high schools. Doing so will ascertain and extend study results to a more heterogeneous sample.

The question about causality, whether changes in teacher collaboration lead to changes in teacher efficacy or vice-versa, has plagued efficacy research. Though the current study did not employ methods to account for causality, suffice to say that reciprocal causation does not mean that the reciprocal influences are concurrent (Bandura, 2001). It takes time for a causal factor to exert its influence on other factors and activate the reciprocal influences. The evidence from the current study reveals that teacher efficacy, teacher collaboration, and academic press share a reciprocal relationship.

Conclusion

In conclusion, using a sample of urban elementary schools, this study aimed to analyze the relationship between teacher efficacy, teacher collaboration, and school academic press. A teacher's sense of high efficacy has been related continuously to various student-level outcomes like higher achievement and better behavior. Moreover, efficacious teachers tend to report feelings of less stress and less burnout and hence are more likely to stay in the profession. Thus, teacher efficacy is of significance for urban schools that have been hindered by low achievement scores and high rates of teacher attrition. For these schools, knowledge of school and teacher-level factors that account for and aid in variation in teacher sense of efficacy is of particular relevance.

The present study set out to investigate if teacher collaboration and school academic press can account for variation in teacher efficacy. Teacher collaboration, focused on instruction and mandated by the state, is a recent addition to a teacher's job description. A school academic press represents an environment that is focused on teaching and learning. Schools with high academic press have policies, procedures, expectations, and rewards geared towards academics and achievement.

The current study employed social cognitive theory and proposed that school academic press and teacher collaboration may have an association with teacher efficacy because academic press and teacher collaboration operate through the sources of efficacy viz. social persuasion, mastery, and vicarious learning.

Using multilevel models, the study provided support for the hypothesis and reported that variation in teacher collaboration and school academic press explained more

than half of the observed variation in teacher efficacy. The results are relevant as they suggest that school characteristics like an environment of academic press and collaboration may influence teacher efficacy beliefs. In this regard, the study offers school leaders pathways to impact teacher efficacy. At the same time, the study opens avenues for future research such as identifying other variables that can explain the residual variation in teacher efficacy and further our understanding of the workings of the trio: teacher efficacy, teacher collaboration, and school academic press.

List of References

Achinstein, B. (2002). Conflict amid community: The micropolitics of teacher collaboration. *Teachers college record, 104*(3), 421-455.

Alig-Mielcarek, J. M. (2003). *A model of school success: Instructional leadership, academic press, and student achievement.* (Doctoral dissertation). The Ohio State University, Columbus.

Alig-Mielcarek, J. M., & Hoy, W. K. (2005). *Instructional leadership*. Greenwich, CT: Information Age Publishers.

Allinder, R. M. (1994). The relationship between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education, 17*(2), 86-95.

Anderson, R. N., Greene, M. L., & Loewen, P. S. (1988). Relationships among teachers' and students' thinking skills, sense of efficacy, and student achievement. *Alberta Journal of Educational Research, 34*(2), 148-165.

Armor, D. J., Conry-Oseguera, P., Cox, M., King, N. J., McDonnell, L. M., Pascal, A. H., & Zellman, G. L. (1976). *Analysis of the School Preferred Reading Program in Selected Los Angeles Minority Schools*. Santa Monica, CA: Rand Corp.

Ashton, P. (1984). Teachers' Sense of Efficacy: A Self-or Norm-Referenced Construct? *Florida Journal of Educational Research, 26*(1), 29-41.

Ashton, P. T., & Webb, R. B. (1986). *Making a difference: Teachers' sense of efficacy and student achievement*. New York, NY: Longman.

Bandalos, D. L., & Finney, S. J. (2010). Exploratory and confirmatory Analysis in G. H. R. Mueller (Ed.), *The reviewer's guide to quantitative methods in the social sciences* (pp. 93-114). New York.

Bandura, A. (1974). The case of the mistaken dependent variable. *Journal of Abnormal Psychology, 83*(3), 301-303.

Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamities. *Journal of personality and social psychology, 45*(2), 464-469.

Bandura, A. (1986a). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology, 4*(3), 359-373.

Bandura, A. (1986b). *Social foundations of thought and action : a social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1988). Organisational applications of social cognitive theory. *Australian Journal of management, 13*(2), 275-302.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental psychology, 25*(5), 729-735.

Bandura, A. (1994). Self-efficacy. *Encyclopedia of human behavior, 4*(4), 71-81.

Bandura, A. (1995). Comments on the crusade against the causal efficacy of human thought. *Journal of Behavior Therapy and Experimental Psychiatry, 26*(3), 179-190.

Bandura, A. (1997a). *Self-efficacy : the exercise of control*. New York, NY: Freeman.

Bandura, A. (1997b). *Self-efficacy: The exercise of control*: Macmillan.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian journal of social psychology, 2*(1), 21-41.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual review of psychology, 52*(1), 1-26.

Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of applied psychology, 88*(1), 87-99.

Barron, J. B. (2014). *Investigating the Structure and Process of Academic Emphasis on Student Achievement: A Multi-Level Analysis.* Texas A&M University, College Station, TX.

Bartholomew, D. J., Knott, M., & Moustaki, I. (2011). *Latent variable models and factor analysis: A unified approach* (3rd ed.). West Sussex, UK: John Wiley & Sons.

Beard, K. S. (2008). *An exploratory study of academic optimism and flow of elementary school teachers.* (Doctoral Dissertation). The Ohio State University, Columbus, OH.

Beard, K. S., Hoy, W. K., & Hoy, A. W. (2010). Academic optimism of individual teachers: Confirming a new construct. *Teaching and Teacher Education, 26*(5), 1136-1144.

Berebitsky, D. P. (2010). *Teacher's Academic Press and student achievement in reading comprehension.* (Doctoral Dissertation). University of Michigan, Ann Arbor, MI.

Berman, P. (1977). *Federal Programs Supporting Educational Change, Vol. VII: Factors Affecting Implementation and Continuation*. Santa Monica, CA: Rand Corp Retrieved from https://www.rand.org/pubs/reports/R1589z7.html.

Berry, B., Daughtrey, A., & Wieder, A. (2009). Collaboration: Closing the Effective Teaching Gap. *Center for Teaching Quality*.

Bevans, K., Bradshaw, C., Miech, R., & Leaf, P. (2007). Staff-and school-Level predictors of school organizational health: A multilevel analysis. *Journal of School Health, 77*(6), 294-302.

Bolman, L. G., & Deal, T. E. (2017). *Reframing organizations: Artistry, choice, and leadership*. San Francisco, CA: John Wiley & Sons.

Borman, G. D., & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of educational research, 78*(3), 367-409.

Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *The journal of social Psychology, 130*(3), 353-363.

Bovbjerg, K. M. (2006). Teams and collegiality in educational culture. *European Educational Research Journal, 5*(3-4), 244-253.

Bray, J. N. (2000). *Collaborative inquiry in practice: Action, reflection, and making meaning*. Thousand Oaks, CA: Sage.

Brookover, W. B., Schweitzer, J. H., Schneider, J. M., Beady, C. H., Flood, K. P., & Wisenbaker, M. (1978). Elementary school social climate and school achievement. *American educational research journal, 15*(2), 301-318.

Bruner, J. S. (1966). *Toward a theory of instruction* (Vol. 59). Boston, MA: Harvard University Press.

Bryk, A. S., Camburn, E., & Louis, K. S. (1999). Professional community in Chicago elementary schools: Facilitating factors and organizational consequences. *Educational Administration Quarterly, 35*(5), 751-781.

Bryk, A. S., Sebring, P. B., Allensworth, E., Easton, J. Q., & Luppescu, S. (2010). *Organizing schools for improvement: Lessons from Chicago*. Chicago, IL: University of Chicago Press.

Bryk, A. S., & Thum, Y. (1989). The effects of high school organization on dropping out: An exploratory investigation. *American educational research journal, 26*(3), 353-383.

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of school Psychology, 44*(6), 473-490.

Carver-Thomas, D., & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it*. Palo Alto, CA: Learning Policy Institute Retrieved from https://www.fcis.org/uploaded/Data_Reports/Teacher_Turnover_REPORT.pdf.

Chesnut, S. R., & Burley, H. (2015). Self-efficacy as a predictor of commitment to the teaching profession: A meta-analysis. *Educational Research Review, 15*, 1-16.

Chong, W. H., Klassen, R. M., Huan, V. S., Wong, I., & Kates, A. D. (2010). The relationships among school types, teacher efficacy beliefs, and academic climate: Perspective from Asian middle schools. *The Journal of Educational Research, 103*(3), 183-190.

Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of management, 23*(3), 239-290.

Coladarci, T. (1992). Teachers' sense of efficacy and commitment to teaching. *The Journal of experimental education, 60*(4), 323-337.

Coladarci, T., & Fink, D. (1995). *Correlations among measures of teacher efficacy: Are they measuring the same thing.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Coleman, J. S. (1968). Equality of educational opportunity. *Integrated Education, 6*(5), 19-28.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American journal of sociology, 94*, S95-S120.

Collie, R. J., Shapka, J. D., & Perry, N. E. (2012). School climate and social–emotional learning: Predicting teacher stress, job satisfaction, and teaching efficacy. *Journal of educational psychology, 104*(4), 1189-1204.

Comrey, A. L., & Lee, H. B. (2013). *A first course in factor analysis*: Psychology Press.

Conrad, F., & Blair, J. (1996). *From impressions to data: Increasing the objectivity of cognitive interviews.* Paper presented at the Proceedings of the Section on Survey Research Methods, Annual Meetings of the American Statistical Association.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.

Cudeck, R. (2000). Exploratory factor analysis. In *Handbook of applied multivariate statistics and mathematical modeling* (pp. 265-296). San Diego, CA: Academic Press.

Czerniak, C. M., & Schriver, M. L. (1994). An examination of preservice science teachers' beliefs and behaviors as related to self-efficacy. *Journal of Science Teacher Education, 5*(3), 77-86.

Darling-Hammond, L. (1994). *Professional development schools: Schools for developing a profession*. New York, NY: Teachers College Press.

Darling-Hammond, L. (2003). Keeping good teachers: Why it matters, what leaders can do. *Educational Leadership, 60*(8), 6-13.

Darling-Hammond, L. (2015). Want to Close the Achievement Gap? Close the Teaching Gap. *American Educator, 38*(4), 14-18.

Darling-Hammond, L., & Richardson, N. (2009). Research review/teacher learning: What matters. *Educational Leadership, 66*(5), 46-53.

David, J. L. (2009). Collaborative inquiry. *Educational Leadership, 66*(4), 87-88.

Davis, F. W., & Yates, B. T. (1982). Self-efficacy expectancies versus outcome expectancies as determinants of performance deficits and depressive affect. *Cognitive Therapy and Research, 6*(1), 23-35.

De Mesquita, P. B., & Drake, J. C. (1994). Educational reform and the self-efficacy beliefs of teachers implementing nongraded primary school programs. *Teaching and Teacher Education, 10*(3), 291-302.

Deemer, S. (2004). Classroom goal orientation in high school classrooms: Revealing links between teacher beliefs and classroom environments. *Educational research, 46*(1), 73-90.

Edmonds, R. (1979). Effective schools for the urban poor. *Educational Leadership, 37*(1), 15-24.

Egodawatte, G., McDougall, D., & Stoilescu, D. (2011). The effects of teacher collaboration in Grade 9 Applied Mathematics. *Educational Research for Policy and Practice, 10*(3), 189-209.

Emmer, E. T., & Hickman, J. (1991). Teacher efficacy in classroom management and discipline. *Educational and Psychological measurement, 51*(3), 755-765.

Enochs, L. G., Scharmann, L. C., & Riggs, I. M. (1995). The relationship of pupil control to preservice elementary science teacher self–efficacy and outcome expectancy. *Science Education, 79*(1), 63-75.

Ericsson, K. A., & Simon, H. A. (1980). Verbal reports as data. *Psychological review, 87*(3), 215-251.

Eubanks, S. (2012). *Advancing a culture of high expectations: Academic press, school conditions and student achievement.* (Doctoral Dissertation). University of Maryland, College Park.

Evans, E. D., & Tribble, M. (1986). Perceived teaching problems, self-efficacy, and commitment to teaching among preservice teachers. *The Journal of Educational Research, 80*(2), 81-85.

Ferron, J. M., Hogarty, K. Y., Dedrick, R. F., Hess, M. R., Niles, J. D., & Kromrey, J. D. (2008). Reporting results from multilevel analyses. In A. A. O'Connell & D. B. McCoach (Eds.), *Multilevel modeling of educational data* (pp. 391-426).

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Thousand Oaks, CA: Sage.

Fives, H., & Gill, M. G. (Eds.). (2014). *International handbook of research on teachers' beliefs*. New York, NY: Routledge.

Forehand, G. A., & Von Haller, G. (1964). Environmental variation in studies of organizational behavior. *Psychological bulletin, 62*(6), 361-382.

Frayne, C. A., & Latham, G. P. (1987). Application of social learning theory to employee self-management of attendance. *Journal of applied psychology, 72*(3), 387-392.

Fulton, K., & Britton, T. (2011). *STEM Teachers in Professional Learning Communities: From Good Teachers to Great Teaching*. Washington, DC: National Commission on Teaching and America's Future Retrieved from https://files.eric.ed.gov/fulltext/ED521328.pdf.

Gallimore, R., Ermeling, B. A., Saunders, W. M., & Goldenberg, C. (2009). Moving the learning of teaching closer to practice: Teacher education implications of school-based inquiry teams. *The Elementary School Journal, 109*(5), 537-553.

Garcia, M. E., Schmitz, J. M., & Doerfler, L. A. (1990). A fine-grained analysis of the role of self-efficacy in self-initiated attempts to quit smoking. *Journal of Consulting and Clinical Psychology, 58*(3), 317-322.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of educational psychology, 76*(4), 569-582.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of management Review, 17*(2), 183-211.

Goddard, R. D. (2001). Collective efficacy: A neglected construct in the study of schools and student achievement. *Journal of educational psychology, 93*(3), 467-476.

Goddard, R. D., & Goddard, Y. L. (2001). A multilevel analysis of the relationship between teacher and collective efficacy in urban schools. *Teaching and Teacher Education, 17*(7), 807-818.

Goddard, R. D., Goddard, Y. L., Eun Sook, K. I. M., & Miller, R. (2015). A Theoretical and Empirical Analysis of the Roles of Instructional Leadership, Teacher Collaboration, and Collective Efficacy Beliefs in Support of Student Learning. *American Journal of Education, 121*(4), 501-530.

Goddard, R. D., Hoy, W. K., & Hoy, A. E. W. (2000). Collective teacher efficacy: Its meaning, measure, and impact on student achievement. *American educational research journal, 37*(2), 479-507.

Goddard, R. D., Hoy, W. K., & Hoy, A. E. W. (2004). Collective efficacy beliefs: Theoretical developments, empirical evidence, and future directions. *Educational researcher, 33*(3), 3-13.

Goddard, R. D., & LoGerfo, L. F. (2007). Measuring emergent organizational properties: A structural equation modeling test of self-versus group-referent perceptions. *Educational and Psychological measurement, 67*(5), 845-858.

Goddard, R. D., Sweetland, S. R., & Hoy, W. K. (2000). Academic emphasis of urban elementary schools and student achievement in reading and mathematics: A multilevel analysis. *Educational Administration Quarterly, 36*(5), 683-702.

Goddard, R. D., Tschannen-Moran, M., & Hoy, W. K. (2001). A multilevel examination of the distribution and effects of teacher trust in students and parents in urban elementary schools. *The Elementary School Journal, 102*(1), 3-17.

Goddard, Y. L., Goddard, R. D., & Kim, M. (2015). School instructional climate and student achievement: An examination of group norms for differentiated instruction. *American Journal of Education, 122*(1), 111-131.

Goddard, Y. L., Goddard, R. D., & Tschannen-Moran, M. (2007). A theoretical and empirical investigation of teacher collaboration for school improvement and student achievement in public elementary schools. *Teachers college record, 109*(4), 877-896.

Goddard, Y. L., & Kim, M. (2018). Examining Connections between Teacher Perceptions of Collaboration, Differentiated Instruction, and Teacher Efficacy. *Teachers college record, 120*(1), 90-103.

Goddard, Y. L., Miller, R., Larsen, R., Goddard, R., Madsen, J., & Schroeder, P. (2010). *Connecting Principal Leadership, Teacher Collaboration, and Student Achievement.* Paper presented at the American Education Research Association Annual Conference, Denver, CO.

Goodnough, K. (2005). Fostering teacher learning through collaborative inquiry. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 79*(2), 88-92.

Gray, J., Kruse, S., & Tarter, C. J. (2016). Enabling school structures, collegial trust and academic emphasis : Antecedents of professional learning communities. *Educational Management Administration & Leadership, 44*(6), 875-891.

Guskey, T. R. (1981). Measurement of the responsibility teachers assume for academic successes and failures in the classroom. *Journal of Teacher Education, 32*(3), 44-51.

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education, 4*(1), 63-69.

Guskey, T. R., & Passaro, P. D. (1994). Teacher efficacy: A study of construct dimensions. *American educational research journal, 31*(3), 627-643.

Hackman, J. R. (1990). *Groups that work and those that don't*. San Francisco, CA: Jossey-Bass.

Hallam, P. R., Smith, H. R., Hite, J. M., Hite, S. J., & Wilcox, B. R. (2015). Trust and collaboration in PLC teams: Teacher relationships, principal support, and collaborative benefits. *NASSP Bulletin, 99*(3), 193-216.

Hallinger, P. (2003). Leading educational change: Reflections on the practice of instructional and transformational leadership. *Cambridge journal of education, 33*(3), 329-352.

Hallinger, P., & Heck, R. H. (1996). Reassessing the principal's role in school effectiveness: A review of empirical research, 1980-1995. *Educational Administration Quarterly, 32*(1), 5-44.

Hallinger, P., & Murphy, J. F. (1986). The social context of effective schools. *American Journal of Education, 94*(3), 328-355.

Halpin, A. W., & Croft, D. B. (1962). *The organizational climate of schools* (Vol. 11): Midewest Administration Center, University of Chicago.

Hanushek, E. A., Rivkin, S. G., & Schiman, J. C. (2016). Dynamic effects of teacher turnover on the quality of instruction. *Economics of Education Review, 55*, 132-148.

Hargreaves, A. (2001). Emotional geographies of teaching. *Teachers college record, 103*(6), 1056-1080.

Head, G. (2009a). Effective collaboration: deep collaboration as an essential element of the learning process. *The Journal of Educational Enquiry, 4*(2), 47-62.

Head, G. (2009b). Effective collaboration: deep collaboration as an essential element of the learning process. *The Journal of Educational Enquiry, 4*(2).

Heck, R. H., Tabata, L., & Thomas, S. L. (2013). *Multilevel and longitudinal modeling with IBM SPSS*. New York, NY: Routledge.

Henson, R. K. (2001). *Teacher self-efficacy: Substantive implications and measurement dilemmas*. Paper presented at the Annual Meeting of the Educational Research Exchange, College Station, TX.

Henson, R. K., Kogan, L. R., & Vacha-Haase, T. (2001). A reliability generalization study of the teacher efficacy scale and related instruments. *Educational and Psychological measurement, 61*(3), 404-420.

Hoover-Dempsey, K. V., Bassler, O. C., & Brissie, J. S. (1992). Explorations in parent-school relations. *The Journal of Educational Research, 85*(5), 287-294.

Hox, J. J., Moerbeek, M., & Van de Schoot, R. (2017). *Multilevel analysis: Techniques and applications*. New York, NY: Routledge.

Hoy, A. W., Hoy, W. K., & Kurz, N. M. (2008). Teacher's academic optimism: The development and test of a new construct. *Teaching and Teacher Education, 24*(4), 821-835.

Hoy, W. K. (2012). School characteristics that make a difference for the achievement of all students: A 40-year odyssey. *Journal of Educational Administration, 50*(1), 76-97.

Hoy, W. K., & Adams, C. M. (2015). *Quantitative research in education: A primer*. Thousand Oaks, CA: Sage.

Hoy, W. K., & Fedman, J. A. (1987). Organizational health: The concept and its measure. *Journal of research and Development in Education, 20*(4), 30-37.

Hoy, W. K., & Feldman, J. A. (1999). Organizational health profiles for high schools. In *School climate: Measuring, improving and sustaining healthy learning environments*. Philadelphia, PA: Falmer Press.

Hoy, W. K., Miskel, C. G., & Tarter, C. J. (2012). *Educational administration : theory, research, and practice*. New York, NY: McGraw-Hill.

Hoy, W. K., & Sabo, D. J. (1998). *Quality middle schools: Open and healthy*. Thousand Oaks, CA: Corwin Press.

Hoy, W. K., Smith, P. A., & Sweetland, S. R. (2002). The development of the organizational climate index for high schools: Its measure and relationship to faculty trust. *The High School Journal, 86*(2), 38-49.

Hoy, W. K., Sweetland, S. R., & Smith, P. A. (2002). Toward an Organizational Model of Achievement in High Schools: The Significance of Collective Efficacy. *Educational Administration Quarterly, 38*(1), 77-93.

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

Hoy, W. K., Tarter, C. J., & Kottkamp, R. B. (1991). *Open schools, healthy schools: Measuring organizational climate*. Thousand Oaks, CA: Corwin Press.

Hoy, W. K., & Woolfolk, A. E. (1993). Teachers' Sense of Efficacy and the Organizational Health of Schools. *Elementary School Journal, 93*(4), 355-372.

Ibrahim, D., Sedat, G., & Mehmet, S. B. (2013). Multilevel analysis of teacher work attitudes: The influence of principal leadership and teacher collaboration. *International Journal of Educational Management, 27*(7), 700-719. doi:10.1108/IJEM-09-2012-0107

Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American educational research journal, 38*(3), 499-534.

Ingersoll, R. M., & Smith, T. M. (2003). The wrong solution to the teacher shortage. *Educational Leadership, 60*(8), 30-33.

Johnson, B. (2003). Teacher collaboration: Good for some, not so good for others. *Educational Studies, 29*(4), 337-350.

Johnson, D. R., & Young, R. (2011). Toward best practices in analyzing datasets with missing data: Comparisons and recommendations. *Journal of Marriage and Family, 73*(5), 926-945.

Kelchtermans, G. (2006). Teacher collaboration and collegiality as workplace conditions. A review. *Zeitschrift fur padagogik, 52*(2), 220.

Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of behavioral research*. Fort Worth, TX: Harcourt College Publishers.

Kirby, M. M., & DiPaola, M. F. (2011). Academic optimism and community engagement in urban schools. *Journal of Educational Administration, 49*(5), 542-562. doi:10.1108/09578231111159539

Klassen, R. M., & Chiu, M. M. (2010). Effects on teachers' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress. *Journal of educational psychology, 102*(3), 741-756.

Klassen, R. M., Tze, V. M. C., Betts, S. M., & Gordon, K. A. (2011). Teacher Efficacy Research 1998-2009: Signs of Progress or Unfulfilled Promise? *Educ Psychol Rev Educational Psychology Review, 23*(1), 21-43.

Kleinsasser, R. C. (2014). Teacher efficacy in teaching and teacher education. *Teaching and Teacher Education, 44*, 168-179.

Kline, P. (2014). *An easy guide to factor analysis*. New York, NY: Routledge.

Kline, R. (2013). Exploratory and Confirmatory Factor Analysis. In *Applied quantitative analysis in education and the social sciences* (pp. 183-217). New York, NY: Routledge.

Klusmann, U., Richter, D., & Lüdtke, O. (2016). Teachers' emotional exhaustion is negatively related to students' achievement: Evidence from a large-scale assessment study. *Journal of educational psychology*, *108*(8), 1193-1203.

Knapp, T. R., & Mueller, R. O. (2010). Reliability and validity of instruments. *The reviewer's guide to quantitative methods in the social sciences*, 337-342.

Köhnken, G., Milne, R., Memon, A., & Bull, R. (1999). The cognitive interview: A meta-analysis. *Psychology, Crime and Law*, *5*(1-2), 3-27.

LeBlanc, L., Swisher, R., Vitaro, F., & Tremblay, R. E. (2007). School social climate and teachers' perceptions of classroom behavior problems: A 10 year longitudinal and multilevel study. *Social psychology of education*, *10*(4), 429-442.

Lee, C. (1983). Self-efficacy and behaviour as predictors of subsequent behaviour in an Assertiveness Training Programme. *Behaviour Research and Therapy*, *21*(3), 225-232.

Lee, E., Smith, B., Perry, T. E., & Smylie, M. A. (1999). Social Support, Academic Press, and Student Achievement: A View from the Middle Grades in Chicago. Improving Chicago's Schools. A Report of the Chicago Annenberg Research Project.

Lee, J., & Shute, V. J. (2010). Personal and social-contextual factors in K–12 academic performance: An integrative perspective on student learning. *Educational Psychologist*, *45*(3), 185-202.

Lee, V. E., Dedrick, R. F., & Smith, J. B. (1991). The effect of the social organization of schools on teachers' efficacy and satisfaction. *Sociology of Education*, *64*(3), 190-208.

Leithwood, K., & Jantzi, D. (2008). Linking leadership to student learning: The contributions of leader efficacy. *Educational Administration Quarterly*, *44*(4), 496-528.

Leithwood, K., & Sun, J. (2018). Academic culture: a promising mediator of school leaders' influence on student learning. *Journal of Educational Administration*, *56*(3), 350-363.

Lent, R. W., & Hackett, G. (1987). Career self-efficacy: Empirical status and future directions. *Journal of vocational Behavior, 30*(3), 347-382.

Little, J. W. (1990). The persistence of privacy: Autonomy and initiative in teachers' professional relations. *Teachers college record, 91*(4), 509-536.

Little, J. W. (2002). Locating learning in teachers' communities of practice: Opening up problems of analysis in records of everyday work. *Teaching and Teacher Education, 18*(8), 917-946.

Liu, S., & Hallinger, P. (2018). Principal Instructional Leadership, Teacher Self-Efficacy, and Teacher Professional Learning in China: Testing a Mediated-Effects Model. *Educational Administration Quarterly Educational Administration Quarterly, 54*(4), 501-528.

Lloyd, J., McNulty, B., & Telfer, D. (2009). The Ohio Improvement Process (OIP): Flavor of the Day or Impetus for Sustainable Improvement? Retrieved from http://sst13.cloudapp.net/wp-content/uploads/2014/11/OIP-Flavor-of-the-Day.pdf

Lloyd, J., McNulty, B., & Telfer, D. (2014). The Ohio Improvement Process.

Lomax, R. G., & Schumacker, R. E. (2004). *A beginner's guide to structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Lomos, C., Hofman, R. H., & Bosker, R. J. (2011). Professional communities and student achievement–a meta-analysis. *School effectiveness and school improvement, 22*(2), 121-148.

Ma, X., Ma, L., & Bradley, K. D. (2008). Using multilevel modeling to investigate school effects. In A. A. O'Connell & D. B. McCoach (Eds.), *Multilevel modeling of educational data* (pp. 59-110).

Main, K. (2012). Effective middle school teacher teams: A ternary model of interdependency rather than a catch phrase. *Teachers and Teaching, 18*(1), 75-88.

Manning, M. M., & Wright, T. L. (1983). Self-efficacy expectancies, outcome expectancies, and the persistence of pain control in childbirth. *Journal of personality and social psychology, 45*(2), 421-431.

Marsh, J. A., Pane, J. F., & Hamilton, L. S. (2006). *Making sense of data-driven decision making in education: Evidence from recent RAND research*. Santa Monica, CA: RAND Corp.

Mattessich, P. W., & Monsey, B. R. (1992). *Collaboration: what makes it work. A review of research literature on factors influencing successful collaboration*. St. Paul, MN: Amherst H. Wilder Foundation Retrieved from http://wwwhhh.oit.umn.edu/centers/pnlc/pdf/DesignImplementationCross-Sector.pdf.

McCoach, D. B. (2010a). Dealing with dependence (Part II): A gentle introduction to hierarchical linear modeling. *Gifted Child Quarterly, 54*(3), 252-256.

McCoach, D. B. (2010b). Hierarchical linear modeling. In G. G. Hancock & R. O. Mueller (Eds.), *The reviewer's guide to quantitative methods in the social sciences* (pp. 123-140).

McCoach, D. B., & Adelson, J. L. (2010). Dealing with dependence (Part I): Understanding the effects of clustered data. *Gifted Child Quarterly, 54*(2), 152-155.

McCoach, D. B., & Black, A. C. (2008). Evaluation of model fit and adequacy. In A. A. O'Connell & D. B. McCoach (Eds.), *Multilevel modeling of educational data* (pp. 245-272).

McDonald, R. I., & Crandall, C. S. (2015). Social norms and social influence. *Current Opinion in Behavioral Sciences, 3*, 147-151.

McGuigan, L., & Hoy, W. K. (2006). Principal leadership: Creating a culture of academic optimism to improve achievement for all students. *Leadership and policy in schools, 5*(3), 203-229.

Meirink, J. A., Imants, J., Meijer, P. C., & Verloop, N. (2010). Teacher learning and collaboration in innovative teams. *Cambridge journal of education, 40*(2), 161-181.

Mertens, S., & Flowers, N. (2004). *Research Summary: Interdisciplinary teaming*. Westerville, OH: National Middle School Association.

Meyers, L. S., Gamst, G., & Guarino, A. J. (2016). *Applied multivariate research: Design and interpretation*. Thousand Oaks, CA: Sage.

Midgley, C., Feldlaufer, H., & Eccles, J. S. (1989). Change in teacher efficacy and student self-and task-related beliefs in mathematics during the transition to junior high school. *Journal of educational psychology, 81*(2), 247-258.

Miles, M. B. (1969). Planned change and organizational health: Figure and ground. *Organizations and human behavior*, 375-391.

Miller, J. E. (2013). *The Chicago guide to writing about multivariate analysis*: University of Chicago Press.

Miller, R. J., Goddard, Y. L., Goddard, R. D., Larsen, R., & Jacob, R. (2010). *Instructional Leadership: A Pathway to Teacher Collaboration and Student Achievement*. Paper presented at the University Council for Educational Administration, New Orleans, LA.

Mitchell, R. M., Kensler, L. A., & Tschannen-Moran, M. (2015). Examining the effects of instructional leadership on school academic press and student achievement. *Journal of School Leadership, 25*(2), 223-251.

Moe, K. O., & Zeiss, A. M. (1982). Measuring self-efficacy expectations for social skills: A methodological inquiry. *Cognitive Therapy and Research, 6*(2), 191-205.

Moolenaar, N. M., Sleegers, P. J., & Daly, A. J. (2012). Teaming up: Linking collaboration networks, collective efficacy, and student achievement. *Teaching and Teacher Education, 28*(2), 251-262.

Moore, W. P., & Esselman, M. E. (1992). *Teacher Efficacy, Empowerment, and a Focused Instructional Climate: Does Student Achievement Benefit?* Paper presented at the annual meeting of The American Educational Research Association, San Francisco, CA.

Moore, W. P., & Esselman, M. E. (1994). *Exploring the Context of Teacher Efficacy: The Role of Achievement and Climate*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Munn Sunny, L. J. (2017). *Evaluating the Ohio Improvement Process*. Retrieved from Columbus, OH: http://glennweb.glenn.it.osu.edu/wp-content/uploads/2017/09/EvaluatingtheOhioImprovementProcess_Final_4.11.17.pdf

Murnane, R. J., & Willett, J. B. (2010). *Methods matter: Improving causal inference in educational and social science research*. Oxford, UK: Oxford University Press.

Murphy, J. F., Weil, M., Hallinger, P., & Mitman, A. (1982). Academic press: Translating high expectations into school policies and classroom practices. *Educational Leadership, 40*(3), 22-26.

Nathaniel, P., Sandilos, L. E., Pendergast, L., & Mankin, A. (2016). Teacher stress, teaching-efficacy, and job satisfaction in response to test-based educational accountability policies. *Learning and Individual Differences, 50*, 308-317.

Nelson, T., & Slavit, D. (2008). Supported teacher collaborative inquiry. *Teacher Education Quarterly, 35*(1), 99-116.

O'Connell, A. A., & McCoach, D. B. (2008). *Multilevel modeling of educational data*. Charlotte, NC: Information Age.

Ohio Department of Education. (2015a). Every Student Succeeds Act. Retrieved from http://education.ohio.gov/Topics/Every-Student-Succeeds-Act-ESSA

Ohio Department of Education. (2015b). Ohio Improvement Process. Retrieved from http://education.ohio.gov/Topics/District-and-School-Continuous-Improvement/Ohio-Improvement-Process

Ohio Department of Education. (2016a). FY 2016 District profile. https://education.ohio.gov/Topics/Finance-and-Funding/School-Payment-Reports/District-Profile-Reports/FY2016-District-Profile-Report

Ohio Department of Education. (2016b). Ohio Teacher Evaluation System. Retrieved from http://education.ohio.gov/Topics/Teaching/Educator-Evaluation-System/Ohio-s-Teacher-Evaluation-System

Ohio Leadership Advisory Council. (2013). Leadership development framework. 2nd. Retrieved from https://ohioleadership.org/up_doc_cms/OLAC_LDF.pdf

Ostovar-Nameghi, S. A., & Sheikhahmadi, M. (2016). From teacher isolation to teacher collaboration: Theoretical perspectives and empirical findings. *English language teaching, 9*(5), 97-205.

Pajares, F. (1996a). *Assessing Self-Efficacy Beliefs and Academic Outcomes: The Case for Specificity and Correspondence*. Paper presented at the American Educational Research Association, New York.

Pajares, F. (1996b). *Current directions in self research: Self-efficacy.* Paper presented at the annual meeting of the American Educational Research Association, New York.

Pajares, F. (1996c). Self-efficacy beliefs in academic settings. *Review of educational research, 66*(4), 543-578.

Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of educational psychology, 86*(2), 193-203.

Pajares, F., & Schunk, D. H. (2001). Self-beliefs and school success: Self-efficacy, self-concept, and school achievement. *Perception, 11*, 239-266.

Pas, E. T., Bradshaw, C. P., & Hershfeldt, P. A. (2012). Teacher-and school-level predictors of teacher efficacy and burnout: Identifying potential areas for support. *Journal of school Psychology, 50*(1), 129-145.

Phillips, M. (1997). What Makes Schools Effective? A Comparison of the Relationships of Communitarian Climate and Academic Climate to Mathematics Achievement and Attendance during Middle School. *American educational research journal, 34*(4), 633-662. doi:10.2307/1163352

Pisano, G. P., & Verganti, R. (2008). Which kind of collaboration is right for you. *Harvard business review, 86*(12), 78-86.

Pounder, D. G. (1998). Teacher Teams: Redesigning Teachers' Work. In *Restructuring schools for collaboration: Promises and pitfalls* (pp. 65-88). Albany, NY: State University of New York Press.

Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Fretz, E., Duncan, R. G., & Soloway, E. (2004). A scaffolding design framework for software to support science inquiry. *The journal of the learning sciences, 13*(3), 337-386.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). Thousand Oaks, CA: Sage.

Raudenbush, S. W., Rowan, B., & Cheong, Y. F. (1992). Contextual effects on the self-perceived efficacy of high school teachers. *Sociology of Education*, 150-167.

Riggs, I. M. (1991). *Gender Differences in Elementary Science Teacher Self-Efficacy*. Paper presented at the annual meeting of the American Educational Research Association Chicago, IL.

Righter, K. (2017). *Assessing the Impact of Data-based Collaborative Practice on Student Achievement.* (Ed.D Thesis). The Ohio State University, Columbus.

Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American educational research journal, 50*(1), 4-36.

Rose, J. S., & Medway, J. (1981). Measurement of teachers' beliefs in their control over student outcome. *The Journal of Educational Research, 74*(3), 185-190.

Rosenholtz, S. J. (1989a). *Teachers' workplace: The social organization of schools*. New York, NY: Longman.

Rosenholtz, S. J. (1989b). Workplace conditions that affect teacher quality and commitment: Implications for teacher induction programs. *The Elementary School Journal, 89*(4), 421-439.

Rosenholtz, S. J., & Simpson, C. (1990). Workplace conditions and the rise and fall of teachers' commitment. *Sociology of Education, 63*(4), 241-257.

Ross, J. A. (1992). Teacher Efficacy and the Effects of Coaching on Student Achievement. *Canadian Journal of Education, 17*(1), 51-65.

Ross, J. A. (1994). *Beliefs that Make a Difference: The Origins and Impacts of Teacher Efficacy*. Paper presented at the annual meeting of the Canadian Association for curriculum studies.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological monographs: General and applied, 80*(1), 1-28.

Schafer, J. L., & Graham, J. W. (2002). Missing data: our view of the state of the art. *Psychological methods, 7*(2), 147.

Schrage, M. (1990). *Shared minds: The new technologies of collaboration*. New York, NY: John Brockman.

Schunk, D. H. (1981). Modeling and attributional effects on children's achievement: A self-efficacy analysis. *Journal of educational psychology, 73*(1), 93-105.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26*(3-4), 207-231.

Schunk, D. H. (2015). *Learning Theories : an Educational Perspective* (6th ed.). Boston, MA: Pearson.

Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2008). *Motivation in education: Theory, research, and applications*. Upper Saddle River, NJ: Pearson.

Schwarzer, R., & Hallum, S. (2008). Perceived teacher self-efficacy as a predictor of job stress and burnout: Mediation analyses. *Applied psychology, 57*, 152-171.

Scribner, J. P., Sawyer, R. K., Watson, S. T., & Myers, V. L. (2007). Teacher teams and distributed leadership: A study of group discourse and collaboration. *Educational Administration Quarterly, 43*(1), 67-100.

Sehgal, P., Nambudiri, R., & Mishra, S. K. (2017). Teacher effectiveness through self-efficacy, collaboration and principal leadership. *International Journal of Educational Management, 31*(4), 505-517.

Shaughnessy, M. F. (2004). An Interview with Anita Woolfolk: The Educational Psychology of Teacher Efficacy. *Educational Psychology Review, 16*(2), 153-176.

Shouse, R. C. (1996). Academic press and sense of community: Conflict, congruence, and implications for student achievement. *Social psychology of education, 1*(1), 47-68.

Simon, N. S., & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What we know and can do. *Teachers college record, 117*(3), 1-36.

Singer, J. D., Willett, J. B., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford, UK: Oxford university press.

Skaalvik, E. M., & Skaalvik, S. (2017). Motivated for teaching? Associations with school goal structure, teacher self-efficacy, job satisfaction and emotional exhaustion. *Teaching and Teacher Education, 67*, 152-160.

Slavit, D., Kennedy, A., Lean, Z., Nelson, T. H., & Deuel, A. (2011). Support for professional collaboration in middle school mathematics: A complex web. *Teacher Education Quarterly, 38*(3), 113-131.

Smylie, M. A. (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American educational research journal, 25*(1), 1-30.

Snijders, T. A. B., & Bosker, R. J. (2012). *Multilevel analysis : an introduction to basic and advanced multilevel modeling* (2nd ed.). Thousand Oaks, CA: Sage.

Solomon, D., Battistich, V., & Hom, A. (1996). Teacher beliefs and practices in schools serving communities that differ in socioeconomic level. *The Journal of experimental education, 64*(4), 327-347.

Soodak, L. C., & Podell, D. M. (1993). Teacher efficacy and student problem as factors in special education referral. *The Journal of Special Education, 27*(1), 66-81.

Steele, F. (2008). Module 5: Introduction to multilevel modelling concepts. *LEMMA (Learning Environment for Multilevel Methodology and Applications), Centre for Multilevel Modelling, University of Bristol.* Retrieved from https://www.cmm.bris.ac.uk/lemma/

Strahan, D. (2003). Promoting a collaborative professional culture in three elementary schools that have beaten the odds. *The Elementary School Journal, 104*(2), 127-146.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the US*. Palo Alto, CA: Learning Policy Institute Retrieved from https://learningpolicyinstitute.org/sites/default/files/product-files/A_Coming_Crisis_in_Teaching_REPORT.pdf.

Sweetland, S. R., & Hoy, W. K. (2000). School characteristics and educational outcomes: Toward an organizational model of student achievement in middle schools. *Educational Administration Quarterly, 36*(5), 703-729.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston, MA: Pearson.

Tejeda-Delgado, M. D. C. (2009). Teacher Efficacy, Tolerance, Gender, and Years of Experience and Special Education Referrals. *International Journal of Special Education*, *24*(1), 112-119.

Televantou, I., Marsh, H. W., Kyriakides, L., Nagengast, B., Fletcher, J., & Malmberg, L.-E. (2015). Phantom effects in school composition research: Consequences of failure to control biases due to measurement error in traditional multilevel models. *School effectiveness and school improvement*, *26*(1), 75-101.

Thapa, A., Cohen, J., Guffey, S., & Higgins-D'Alessandro, A. (2013). A review of school climate research. *Review of educational research, 83*(3), 357-385.

Thompson, B. (2004). *Exploratory and confirmatory factor analysis: Understanding concepts and applications*. Washington, DC: American Psychological Association.

Thompson, L. L., Aranda, E. K., Robbins, S. P., & Swenson, C. (2000). *Tools for teams: Building effective teams in the workplace*. Boston, MA: Pearson.

Trentham, L., Silvern, S., & Brogdon, R. (1985). Teacher efficacy and teacher competency ratings. *Psychology in the Schools, 22*(3), 343-352.

Truijen, K., Sleegers, P., Meelissen, M. R., & Nieuwenhuis, A. (2013). What makes teacher teams in a vocational education context effective? A qualitative study of managers' view on team working. *Journal of workplace learning*, *25*(1), 58-73.

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and teacher education., 17*(7), 783-805.

Tschannen-Moran, M., & Hoy, A. W. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *TATE Teaching and Teacher Education, 23*(6), 944-956.

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of educational research, 68*(2), 202-248.

Tschannen-Moran, M., Salloum, S. J., & Goddard, R. (2014). Context matters: The influence of collective beliefs and shared norms. *International handbook of research on teachers' beliefs*, 301-316.

Tsouloupas, C. N., Carson, R. L., Matthews, R., Grawitch, M. J., & Barber, L. K. (2010). Exploring the association between teachers' perceived student misbehaviour and emotional exhaustion: The importance of teacher efficacy beliefs and emotion regulation. *Educational Psychology, 30*(2), 173-189.

Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological bulletin, 63*(6), 384-399.

Twidale, M. B., Nichols, D. M., & Paice, C. D. (1997). Browsing is a collaborative process. *Information Processing & Management, 33*(6), 761-783.

Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2013). Team entitativity and teacher teams in schools: Towards a typology. *Frontline Learning Research, 1*(2), 86-98.

Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. *Educational Research Review, 15*, 17-40.

Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education, 24*(1), 80-91.

Voogt, J. M., Pieters, J. M., & Handelzalts, A. (2016). Teacher collaboration in curriculum design teams: effects, mechanisms, and conditions. *Educational Research and Evaluation, 22*(3-4), 121-140.

Ware, H., & Kitsantas, A. (2007). Teacher and Collective Efficacy Beliefs as Predictors of Professional Commitment. *The Journal of Educational Research, 100*(5), 303-310.

Waters, T., Marzano, R., & McNulty, B. (2005). School Leadership that Works: From Research to Result. *Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).*

Waxman, H. C., Huang, S. L., & Wang, C. (1997). Investigating the classroom learning environment of resilient and non-resilient students from inner-city elementary schools. *International journal of educational research, 27*(4), 343-353.

Weber, G. (1971). *Inner-city children can be taught to read: Four successful schools*. Washington, DC: Council for Basic Education.

Weinstein, C. S., Mignano, A. J., & Romano, M. E. (2011). *Elementary classroom management: Lessons from research and practice*. New York, NY: McGraw-Hill.

Westheimer, J. (2008). Learning among colleagues: teacher community and the shared enterprise of education. In *Handbook of Research on Teacher Education*. Reston, VA: Association of Teacher Educators.

Wheatley, K. F. (2005). The case for reconceptualizing teacher efficacy research. *Teaching and Teacher Education, 21*(7), 747-766.

Willms, J. D., & Raudenbush, S. W. (1989). A longitudinal hierarchical linear model for estimating school effects and their stability. *Journal of educational measurement, 26*(3), 209-232.

Witziers, B., Bosker, R. J., & Krüger, M. L. (2003). Educational leadership and student achievement: The elusive search for an association. *Educational Administration Quarterly, 39*(3), 398-425.

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of management Review, 14*(3), 361-384.

Wood, R. E., Mento, A. J., & Locke, E. A. (1987). Task complexity as a moderator of goal effects: A meta-analysis. *Journal of applied psychology, 72*(3), 416-425.

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of educational psychology, 82*(1), 81-91.

Woolfolk, A. E., Rosoff, B., & Hoy, W. K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education, 6*(2), 137-148.

Yeo, L. S., Ang, R. P., Chong, W. H., Huan, V. S., & Quek, C. L. (2008). Teacher efficacy in the context of teaching low achieving students. *Current Psychology, 27*(3), 192-204.

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology, 9*(2), 79-94.

Zee, M., & Koomen, H. M. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of educational research*, *86*(4), 981-1015.