A Hierarchical Approach to Examine Personal and School Effect on Teacher Motivation

DISSERTATION

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

By

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Graduate Program in Education

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2012

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This dissertation is dedicated to my parents: Wai-Yang Wei and Kan-Ju Tang.
Abstract

In order to depict a better picture of teacher motivation, the researcher developed the theoretical framework based on Deci and Ryan’s (1985) self-determination theory (SDT) and examined factors affecting teachers’ autonomous motivation at both the personal and school level. Several multilevel structural equation models (ML-SEM) were applied to examine the 2007-08 Schools and Staffing Survey data. The results suggested that teachers’ resilience and integrated regulation promoted their commitment. Teachers’ content competency, perceived collaboration and school support, and classroom autonomy were found to effectively motivate them. At the school level, principal control and teacher participation were revealed to have moderating effects on teachers’ autonomous motivation.
Acknowledgments

I would like to express my deepest gratitude to my advisor, Dr. Belinda Gimbert, for her excellent guidance, advice, caring, and always encouraging me during my research. I would also like to thank Dr. Wayne Hoy, Dr. Lynley Anderman, and Dr. Ann O’Connell for guiding my research and helping me develop my theoretical framework and methodology. I have learned so many valuable things from them. My research would not have been possible without their help. Special thanks goes to Dr. Laura Szalacha, who participated in my final oral defense.

I would like to thank my parents, my elder brother Yi-Hsuan Wei, my sister in-law Chia-Yu Ho, and all of my family in Taiwan. They have always been supporting me and encouraging me with their prayers and best wishes.

I would like to thank Dr. Mike Nicholson for leading me to enter the educational field and encouraging me to pursue my dream. I would also like to thank my colleagues at Battelle for Kids and the Olentangy Local Schools. I have enjoyed working with them and learned so much from them. I would like to thank the pastors, brothers and sisters from my church All Nations Christian Fellowship. They have supported me emotionally and spiritually since I came to the United States as an international student eight years ago. Finally, special thanks goes to Sophia Chang and Kate Thorn, who as good friends, for proofreading my dissertation.
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Chapter 1: INTRODUCTION

This chapter briefly introduces the background and purpose of the study, the statement of the problem, the research questions, the significance of the study, the definition of terms, and a brief summary of the research methodology and limitations.

Overview

Since the No Child Left Behind Act of 2001 (NCLB) initiated the recent standards-based education reform in the United States, educators in K-12 public schools across the country have been endeavoring to increase student achievement and to close the achievement gap. Under the NCLB accountability system, student achievement is measured by standardized tests annually, and used as a means to measure the effectiveness of schools as well as the education system as a whole (U.S. Department of Education, 2002). Meanwhile, policymakers have continued to try to find a way to improve student learning and achievement. Existing scholarship has suggested that quality teachers are the essential ingredients of quality education (Black & Wiliam, 1998; Grant & Murray, 1999) as well as one of the most important factors affecting student learning and achievement (Carey, 2004; Haycock, 1998; Sanders & Rivers, 1996). Consequently, student achievement is highly dependent on the quality of instruction (Creemers, 1994; Scheerens & Bosker, 1997). In response to this supposition, the reform policy Race to the Top funds (RtT), signed by President Obama on February 17, 2009,
aims to measure teacher effectiveness based on student achievement data and to improve teacher quality by mandating local educational agencies to incorporate the measure of teacher effectiveness into teacher evaluation and compensation (U.S. Department of Education, 2009). However, some educators are concerned that this reform policy may potentially hinder teachers’ intrinsic motivation to teach. Studies have found that monetary incentives do not inspire dedicated and enthusiastic teachers, but instead foster resentment and dissatisfaction (Frohreich, 1988; Ha & Sung, 2011; Murnane & Cohen, 1986; Ramirez, 2001; Sylvia & Hutchinson, 1985). If financial incentives and monetary rewards do not effectively motivate teachers to teach, as suggested by the reform policy, it is important to examine what factors actually affect teacher motivation and provide suggestions, using empirical evidence, to revise the policy. To this end, the present study aimed to examine the effect of both personal-level and school-level factors on teacher motivation. Specifically, the researcher adopted Deci and Ryan’s (1985) self-determination theory (SDT) as its theoretical framework and investigated the factors that potentially increase teachers’ intrinsic motivation and integrated regulation so that policymakers and school administrators may be able to utilize these factors to promote teacher motivation as a means of enhancing teacher quality and student learning.

Statement of the Problem

Teacher incentive pay has once again been highlighted by the latest reform policy, RttT funding, provided by the American Recovery and Reinvestment Act of 2009 (ARRA). The reform policy RttT is a competitive grant program designed to encourage and reward States that are creating the conditions for education innovation and reform; achieving significant improvement in student outcomes, including making substantial gains in student
achievement, closing achievement gaps, improving high school graduation rates, and ensuring student preparation for success in college and careers; and implementing ambitious plans in four core education reform areas... (U.S. Department of Education, 2009, p. 2)

On March 29, 2010, Tennessee and Delaware were announced to be the recipients of the first round of RttT funding (U.S. Department of Education, 2010a). Tennessee received approximately $502 million and Delaware received $107 million to implement their educational reform plans over the next four years. In addition, on August 24, 2010, the second round of RttT grants was announced, which gave approximately $3.33 billion to nine states (i.e., Massachusetts, New York, Hawaii, Florida, Rhode Island, Maryland, Georgia, North Carolina, and Ohio) and the District of Columbia (U.S. Department of Education, 2010b).

Nineteen selection criteria were addressed in RttT, grouped into five areas, which included Standards and Assessments, Data Systems to Support Instruction, Great Teachers and Leaders, Turning Around Struggling Schools, and Overall Criteria. The policy with regard to teacher incentives on the basis of student achievement is stated in the area Great Teacher and Leaders, particularly in its second criterion: Differentiating teacher and principal effectiveness based on performance. Part of this criterion reads,

The extent to which the State, in collaboration with its participating LEAs (as defined in this notice), has a high-quality plan and ambitious yet achievable annual targets to ensure that participating LEAs (as defined in this notice)—(i) Establish clear approaches to measuring student growth (as defined in this notice) and measure it for each individual student; (5 points) (ii) Design and implement rigorous, transparent, and fair evaluation systems for teachers and principals that (a) differentiate effectiveness using multiple rating categories that take into account data on student growth (as defined in this notice) as a significant factor, and (b) are designed and developed with teacher and principal involvement; (15 points) (iii) Conduct annual evaluations of teachers and principals that include timely and constructive feedback; as part of such evaluations, provide teachers and principals with data on student growth for their students, classes, and schools;
Teacher incentive pay, also known as merit pay or pay for performance, has gained educators and policymakers’ attention periodically throughout the history of U.S. education. Incentive pay should not be confused with policies that pay teachers bonuses or incentives for teaching in hard-to-staff schools or for acquiring additional content certifications or endorsements, which is a common strategy in other various industries, such as the civil service, military, and the private sector (Kowal, Hassel, & Hassel, 2008). Incentive pay is also different from differentiated staffing according to a schedule, such as career ladder compensation plans. Rather, incentive pay aims to reward teachers for actual effectiveness in improving teaching quality and student learning. Frohreich (1988) defined incentive pay as “a compensation plan that provides extra pay or awards for employees who have the same responsibilities and who are judged meritorious based on a performance evaluation” (p. 144). To this end, incentive pay emphasizes extrinsic rewards and aims to directly link teacher salary to performance criteria such as the results of various student achievement measures (Malen, Murphy, & Hart, 1987). The implementation of incentive pay in education can be traced back to the 1980’s when the National Commission on Excellence in Education (1983) recommended that teacher salaries should be “increased, professionally competitive, market-sensitive, and performance-based” (p. 30). Recently, incentive pay and performance-based compensation for teachers have been adopted in various educational policies from time to
time. A current attempt to initiate teacher incentive pay was initiated by the U.S. Department of Education in 2006, known as the Teacher Incentive Fund (TIF), to encourage states to develop and implement performance-based teacher and principal compensation systems based on skills, knowledge, responsibilities, and student performance (Raue, MacAllum, Winkler, & Ristow, 2008).

Whether or not teacher incentive pay should be implemented in education policies has been debated intensely. On the one hand, the advocacy position suggests that incentive pay policies may eliminate unfairness of the traditional pay scale adopted in most schools, which is solely based on teachers’ credentials and seniority (i.e., years of experience), and further recognizes and rewards excellence (Frohreich, 1988). On the other hand, the contrary position is based on various motivation theories suggesting that external rewards cannot possibly increase teaching quality and student learning (Frohreich, 1988; Malen, Murphy, & Hart, 1987). Historically, teacher incentive pay and its goal to excel teacher quality seldom functioned because the definition of effectiveness of teaching and how it could be measured were ambiguous (Murnane & Cohen, 1986). Although student achievement reflected on test scores have been used as a measure of teacher effectiveness, it is undeniable that student achievement on tests is highly associated with their social-economic status (Baharudin & Luster, 1998; Eamon, 2005; Hochschild, 2003; Seyfried, 1998), which cannot possibly be an unbiased measure of teacher effectiveness. Along the same lines, teacher unions have long opposed the idea of evaluating or compensating teachers on the basis of students’ test scores, because it is perceived to be unfair to judge a teacher’s performance on students’ cross-sectional
achievement (Murnane & Cohen, 1986). Thus, Kelley and Finnigan (2004) summarized four essential problems of incentive pay:

1. By identifying a small percentage of the best and brightest teachers, merit pay runs counter to efforts to create cultures of collegiality, cooperation, and trust that characterize effective schools;  
2. Excellence is rarely defined clearly;  
3. The procedures for identifying excellence are typically flawed in fundamental ways;  
4. Districts and states rarely provide consistent funding for these programs, significantly reducing their motivational value (p. 256)

Most educators agree that they enter the teaching profession with a passion and purpose to inspire students and help them pursue better lives. Gutmann (1987) asserted that “a majority of teachers say that they chose their career for its inherent satisfactions: they had a strong desire to teach, to serve society, or to be part of what they consider a worthy profession” (p. 77). Accordingly, incentive pay seems to contradict educators’ intrinsic motivation. Literature has suggested that extrinsic rewards cannot increase behaviors that are intrinsically motivated, but rather, it may actually undermine the intrinsic motivation (Condry, 1977; Deci, 1971; Deci & Ryan, 1985). Other studies have also suggested that intrinsic rewards are of greater importance to educators than extrinsic motivators (Jacobson, 1988; Lortie, 1975). In addition, Lawler (1994) suggested that incentive pay is appropriate for a skill-based system, but it can be problematic when individual contribution is not measurable or when individual contribution cannot be clearly separated in a teamwork environment. Therefore, insofar as teacher collegiality and collaboration are essential and highly valued in the education environment, the competitive nature of incentive pay can potentially lower teacher morale and decrease cooperation (Frohreich, 1988). Thus, Ramirez (2001) referred to incentive pay as a quick-fix strategy that policymakers attempted to motivate administrators and teachers to
become more effective. He argued that the rationale for extrinsic reward systems relying on student performance seems illogical, and little evidence shows that incentive pay improves teacher quality or helps retain effective teachers (Ramirez, 2001).

Purpose

Under the high pressure of the current accountability system, educators and educational researchers have attempted to find the best way to enhance student learning. On the basis of literature that has demonstrated some positive effects of teacher motivation on teaching and learning (Peck, Fox, & Morston, 1977; Rothman, 1981), research on teacher motivation has gained more interest and attention over the past decade (Deniz, Selahattin Avşaroğlu, & Fidan, 2006; Urdan & Turner, 2005; Zimmerman, 2000). For instance, several recent studies have attempted to investigate factors that effectively motivate teachers and subsequently increase teaching quality and student learning (Eren & Tezel, 2010; Gokce, 2010; Hildebrandt & Eom, 2011; Kocabaş, 2009). Although these studies provide valuable insights on teacher motivation, the existing literature has appeared to have two shortcomings which raise the need for the present study. First, many motivating factors examined in the existing studies and experiments have not had strong theoretical support. Different factors were found from different research projects, but without strong theoretical support, these findings were difficult to generalize. Second, many of the experiments have focused on certain aspects of teachers’ individual needs at a personal level, which neglects the multi-dimensional nature of teacher motivation and the added social context of the administrator’s influence and school environment. In order to fill these two gaps, the present study aimed to develop its conceptual framework and research hypotheses on the basis of Deci and Ryan’s (1985)
self-determination theory (SDT) to examine teachers’ innate needs, motivations, and corresponding motivators. In addition, this study focused on teachers’ motivation at both the personal and school level. This multilevel structural equation modeling (ML-SEM) design enabled consideration of teachers’ individual needs and school impact concurrently. This approach attempted to depict a full picture of teacher motivation within the school context.

Research Questions

There were four main research questions driving this study: (1) What is the effect of intrinsic motivators at the personal level, if any, on teacher motivation? (2) What is the effect of extrinsic motivators at the personal level, if any, on teacher motivation? (3) What is the effect of school-level factors, if any, on teacher motivation across schools? (4) How do school-level factors, if any, moderate the effect of motivators on teacher motivation at the personal level?

On the basis of SDT (Deci & Ryan, 1985) and the review of other literature (detailed in Chapter 2), four hypotheses were proposed that corresponded to each research question: (1) Some factors at the personal level, that are considered to satisfy teachers’ basic needs—competence, relatedness, and autonomy—such as teachers’ content competency, perceived collaboration, perceived school support, and classroom autonomy, were hypothesized to have a positive effect on teacher motivation; (2) External rewards, such as base salary and bonus pay, were hypothesized to have no significant effect on teacher motivation; (3) Average teachers’ perceived collaboration and school support at the school level, and teachers’ participation in decision making were hypothesized to result in different teacher motivation across schools; (4) Principals’
leadership styles were hypothesized to moderate the effect of teachers’ personal-level motivators on their motivation.

Significance of the Study

There were three outstanding contributions to the present study. First, SDT has been widely applied to research on student motivation and learning (Jang, 2008; Reeve, 2002; Turner, Warzon, & Christensen, 2011; Vansteenkiste, Lens, & Deci, 2006), but only some studies have applied SDT to investigate teacher motivation (Eyal & Roth, 2011; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). Nonetheless, it was critical to examine teachers’ intrinsic and extrinsic motivation with the theoretical support of SDT. In order to appropriately link the empirical data to the theory, this study applied confirmative factor analyses (CFA) to ensure the quality of each theoretical construct (Byrne, 2012; Schumacker & Lomax, 2010), such as teachers’ motivation, perceived collaboration, and perceived school support.

Second, this study utilized multilevel structural equation modeling (ML-SEM) to examine the effects of explanatory factors at both the personal and school level on teacher motivation simultaneously. The measurement models first examined the intra-class correlation (ICC) to estimate the proportion of variance in teacher motivation that is caused by schools. Then the two-level structural models allowed the level-1 and level-2 parameters to be estimated simultaneously to examine the relationships among dependent and independent constructs while ensuring the constructs are appropriately measured (Byrne, 2012; Muthén & Muthén, 1998-2010). This approach depicted a more complete picture of teacher motivation within the school context and further provided
administrators some practical suggestions on how to foster a school environment that motivates teachers.

Third, this study utilized the national database, *2007-08 Schools and Staffing Survey* (SASS), to examine the personal-level and school-level factors affecting teacher motivation. The SASS national database, reported by the National Center of Education Statistics, is considered to be one of the most complete and reliable surveys systematically measuring the current status of elementary and secondary schools in the U.S. as well as the perceptions of principals and teachers (Tourkin, et al., 2010). Therefore, the results of quantitative analyses on the 2007-08 SASS data in this study provided some generalizable insights for educators and policymakers.

**Conceptual Framework**

The conceptual framework of the study is shown in Figure 1, which illustrates that teacher motivation was hypothesized to be affected at both the personal and school levels. At the teachers’ personal level (the first level of the hierarchical model), factors presumably satisfying teachers’ innate needs, such as competence, relatedness, and autonomy, were hypothesized to positively affect their intrinsic motivation or integrated regulation (Hypothesis 1), whereas external rewards were hypothesized to not effectively increase teacher motivation (Hypothesis 2). At the school level (the second level of the hierarchical model), school-level factors, such as administrator leadership and school environment, were hypothesized to have some influences on individual teachers’ motivation. These school-level factors were hypothesized to result in significantly different levels of overall teacher motivation across schools (Hypothesis 3) or moderate personal-level factors’ effect on teacher motivation (Hypothesis 4).
Figure 1. Conceptual Framework

Summary of Methodology

The present study used the multilevel structural equation modeling (ML-SEM) as its main research design. In order to examine teacher motivation at both the personal and school level simultaneously, this study utilized the strength of the multilevel modeling (MLM) approach. In addition, this study utilized the strength of the structural equation modeling (SEM) approach, because many focal constructs conceptualized in the theoretical framework were measured by teachers’ perception data from the 2007-08 SASS. These constructs, including teacher motivation, perceived collaboration, and perceived school support, were first examined by confirmatory factor analyses (CFA). The proportion of the variability in teacher motivation contributed by schools was also
calculated by the intra-class correlation (ICC) and reported with the measurement model. After the measurement model was verified at both the personal level and school level, the structural models were conducted. The unconditional model focused on modeling teacher motivation with the level-1 explanatory variables. Finally, the contextual model included the level-2 explanatory variables to model the unexplained between-school variability in teacher motivation.

Limitations

Three limitations were considered related to this study. First, the 2007-08 SASS survey items are perception data. Even though literature has suggested that self-reported data can be considered to be reliable because respondents can often accurately report their social environment (Alper, Tjosvold, & Law, 1998), the perception data obtained from the SASS survey data may have some biases at different levels of the analysis. At the first level in the ML-SEM models, teachers’ perception of their motivation and other personal-level factors were deemed appropriate given the research design. However, level-2 data may be biased because principals’ perception of the school environment may not be the reality. For instance, level-2 explanatory variables such as principals’ and teachers’ actual control over school activities may have been measured more accurately by other standard-based instruments.

Second, the distribution of sampled teachers within schools may lead to some sampling errors and biased results. Specifically, the 2007-08 SASS teacher sampling design attempted a self-weighting (i.e., equal probabilities of selection) design to minimize the variance of teacher estimates within the school stratum (Tourkin, et al., 2010). However, in order not to overburden the sampled schools, this constraint was
relaxed, and a minimum of one and a maximum of 20 teachers were sampled in each sampled school. When a sampled school had more than 20 sampled teachers, the sample size was reduced to 20. Even though Tourkin et al. (2010) suggested that the teacher sample size was large enough to meet the reliability requirements, the reduced teacher samples may potentially result in sampling errors and biased results.

Third, insofar as the 2007-08 SASS survey items were used as explanatory variables on teacher motivation, it is possible that there were other predicting factors existing at personal or school level that were not captured in the SASS questionnaires. The results of the ML-SEM models reported the amount of variance left unexplained in the final contextual model, which can be considered evidence as to whether other predicting factors that were not captured in the study should be investigated in future studies.

Definition of Terms

One of the simple definitions of motivation is that “motivation is the study of the internal processes that give behavior its energy and direction” (Reeve, 1996, p. 2). The present study examined teacher motivation and investigated factors affecting teacher motivation at both the personal and school levels. Thus, in terms of a two-level model, teachers’ personal level was considered as the first level or the within-school level, whereas the school level was be considered as the second level or the between-school level. Schools were considered as the level-2 units or groups.

In addition, since the 2007-08 SASS dataset was used for data analyses, schools and principals in the 2007-08 SASS administration were defined as “public, public charter, private, and BIE [Bureau of Indian Education]-funded schools with students in
any of grades 1-12 or in comparable ungraded levels and in operation in school year 2007-08” and “principals of the targeted school populations” respectively (Tourkin, et al., 2010, pp. 7-8). Teachers are defined as “teachers in the targeted school populations who taught students in any of grades 1-12 or in comparable ungraded levels in the 2007-08 school year” (p. 8).

Given the background and purpose of the present study introduced in this chapter, the next chapter reviews the existing scholarship on teacher motivation to support the proposed hypotheses with regard to the autonomy-supportive motivating factors and their positive effect on teacher motivation.
Chapter 2: LITERATURE REVIEW

This chapter first reviews Deci and Ryan’s (1985) self-determination theory (SDT), which was adopted as the theoretical framework in the present study. Then, the theories specifically related to teacher motivation are examined. Teacher motivation is defined by two major areas: intrinsic and extrinsic motivation. Finally, school factors that theoretically affect teacher motivation are extrapolated.

In order to answer the research questions concerning teacher motivation, the researcher considered a guiding definition of motivation essential, followed by the types of motivations that apply specifically to teachers. Inarguably, it is difficult to uphold a single definition of motivation, because human behavior is extremely complex (Eren, 1993). Nonetheless, Reeve (1996) suggested that “motivation originates from a variety of sources (needs, cognitions, and emotions), and that these internal processes energize direct behavior in multiple ways such as starting, sustaining, intensifying, focusing, and stopping it” (p. 2).

Within the context of recent studies about teacher motivation, findings have indicated that researchers struggled to conceptualize teachers’ needs and motivation due to the complexity of teacher responsibility and sophisticated school environment (Kocabaş, 2009). For instance, Gokce (2010) examined 4,310 elementary school teachers’ perception on the basis of several needs-based motivation theories, such as Maslow’s
hierarchy of needs, Alderfer’s (1972) ERG theory, Herzberg’s (1966) two factor theory, and McClelland’s (1961) achievement motivation theory. He concluded that there is no single theory that can clearly explain these teachers’ expression of needs and how these needs can be satisfied. In addition, Finnigan (2010) suggested that applying Vroom’s (1964) expectancy theory within the school context can be biased, because the performance outcome is student achievement rather than the direct performance of teachers. Deci and Ryan’s (1985) self-determination theory (SDT) was adopted as the theoretical framework in this study, because they have conceptualized human beings’ motivation on the basis of their inner needs, such as competence, relatedness, and autonomy. These psychological needs appeared to be applicable to teachers and provided a theoretical foundation for this study. The self-determination theory (Deci & Ryan, 1985) is reviewed in the following section.

Self-Determination Theory

Deci and Ryan (1985) developed the self-determination theory (SDT) on the basis of human beings’ natural tendency, preferring to make their own decisions, rather than being forced by external rewards or pressures. Unlike many other motivation theories that focus on goals or outcomes and the stimuli leading to the preferred outcomes, SDT explains the reason why individuals desire certain outcomes as well as the energization of their behavior (Deci, Vallerand, Pelletier, & Ryan, 1991). One of SDT’s premises is that human beings have three psychological needs: the need for competence, relatedness, and autonomy. Consequently, opportunities to satisfy any of these innate and universal human needs lead to motivation. Therefore, the term “self-determined” implies choices
and volition, suggesting that motivated actions are wholly volitional and endorsed by one’s sense of self (Deci & Ryan, 1991).

Deci and Ryan (1985) used the constructs of regulatory process and the perceived locus of causality to help explain any human behavior and its level of motivation. The regulatory process refers to the different stages of a person endeavoring to differentiate, integrate, and actualize oneself. Insofar as SDT considers human beings’ development as a continuous process of internalizing external contingencies to be autonomous ones, different stages in this regulatory process represent where a person is on this continuum of autonomy. The perceived locus of causality is theorized to be “a cognitive construct representing the degree to which one is self-determining with respect to one’s behavior” (p. 62), meaning an individual’s perception of why they initiate a behavior. The perceived locus of causality is also theorized to exist on a continuum, which ranges from impersonal, external, to internal. An internal perceived locus of causality exists “when a behavior is experienced to be initiated or regulated by an informational event, whether the event occurs inside or outside the person,” whereas an external perceived locus of causality exists “when a behavior is seen as being initiated or regulated by a controlling event, whether that event occurs inside or outside the person” (p. 111).

To this end, SDT categorizes human behaviors into three levels on the basis of their regulatory styles and levels of autonomy: amotivation, intrinsic motivation, and extrinsic motivation (Deci & Ryan, 1985). On the one end, amotivation involves absolutely no self-determination; on the other end, intrinsically motivated behaviors manifest the highest level of autonomy and satisfy human beings’ innate needs, including competence, relatedness, and autonomy. Deci and Ryan’s (1985) research on explaining
and examining factors of social contexts that specifically promote intrinsic motivation is also known as one of the sub-theories of SDT: cognitive evaluation theory (CET). According to SDT, a great amount of human behavior is actually in between these two ends of the autonomy continuum; they are extrinsically motivated. Assuming that human beings inherently desire to internalize and integrate the regulation of uninteresting activities within themselves, SDT distinguishes these extrinsically motivated behaviors into four categories based on the level of internalization, including external, introjected, identified, and integrated regulation (Deci, Vallerand, Pelletier, & Ryan, 1991). By definition, well-internalized kinds of extrinsic motivation are considered autonomous and self-determined. The theory on the process of internalization and integration of values and regulations is also known as one of the sub-theories of SDT: organismic integration theory (OIT).

In addition to the theories on personal behaviors, three concepts emerging from SDT are also essential to the present study: personal goal contents, goal motives, and goal contexts. Specifically, SDT connects human beings’ personal goals, the rationale behind these goals, and the potential effects of social contexts as regulatory contingencies on these goals. In terms of goal content, for instance, personal growth, affiliation, community contribution, and health are considered as intrinsic goals, because they may directly nurture human beings’ basic psychological needs. Reputation, financial success, and physical appearance are considered as extrinsic goals, which have an “outward” or “having” orientation in common (Ryan & Deci, 2000). Vansteenkiste, Lens, and Deci (2006) suggested that the pursuit of intrinsic goals, along with processes of intrinsic motivation and internalization, can be considered as three manifestations of the natural
growth orientation, because they attempt to enhance a person’s self-regulation and autonomy. Related to the concept of goal content are goal motives, which is conceptualized in SDT as the reasons why people pursue certain goal content (Deci & Ryan, 2000). Deci and Ryan (2000) distinguished motives from human beings’ innate psychological needs, suggesting that motives can result from not only people’s natural desire to satisfy their basic needs, including competence, relatedness, and autonomy, but also their desire to substitute or compensate the lack of need satisfaction. They suggested, however, strong compensatory motives, such as extrinsic aspirations, may perpetuate the lack of need satisfaction and result in ill-being. For this reason, goal motives are closely related to the regulatory styles. People usually have autonomous motives when they are intrinsically interested or have fully internalized the importance of an event. In contrast, people usually have controlled motives when they behave for external or introjected reasons. Thus, Sheldon and Kasser (1995) demonstrated that intrinsic goals are often supported by autonomous motives, and extrinsic goals are often supported by controlled motives. Finally, different goal contents and corresponding motives may be strengthened or hindered by different contexts. Specifically, SDT literature has demonstrated that autonomy-supportive contexts tend to promote autonomous motives, whereas controlling contexts tend to promote controlled motives (Pelletier, Fortier, Vallerand, & Briere, 2001). Along these lines, different social contexts (i.e., autonomy-supportive or controlling) may prompt various types of regulations (i.e., autonomous or controlled) and subsequently encourage or discourage certain types of personal goals and motives (Vansteenkiste, Lens, & Deci, 2006).
Although the concepts of intrinsic and extrinsic goals and the contexts promoting or hindering these regulations have been often adopted in studies that focus on student learning (Jang, 2008; Turner, Warzon, & Christensen, 2011; Vansteenkiste, Lens, & Deci, 2006), the researcher applied these theoretical constructs on teacher motivation and potential effects of personal-level and school-level factors within the school context. In the following section, the definition of amotivation in SDT is reviewed. Next, human beings’ intrinsic motivation that results from satisfaction of inner needs, including competence, relatedness, and autonomy are discussed. Last, the internalization process, which is the process of human beings’ attempt to integrate external contingencies to self-regulatory ones, is highlighted.

**Amotivation**

Amotivation is the most impoverished state of autonomy in behavioral regulation, because amotivated behaviors are initiated and regulated by forces completely beyond a person’s intentional control (Deci & Ryan, 1985). An amotivated behavior is not intentional; therefore, it is neither intrinsically nor extrinsically motivated. Insofar as a person does not intend to initiate or regulate an amotivated behavior, it has no identification with the person, who can easily forget, dissociate with, or even distort their behavior. Ryan (1995) suggested that impersonally caused behaviors often occur when people see actions as either irrelevant to the outcomes or infeasible given perceived incompetence or lack of environmental support. In addition, amotivation is often related to a sense of helplessness. Deci and Ryan (1985) suggested that people become amotivated when they are faced with environments that allow neither self-determination nor competence for a given behavior, so that it can be “accompanied by such affective
and cognitive states as listlessness, helplessness, depression, and self-disparagement” (p. 71).

Intrinsic Motivation and Human Needs

Intrinsically motivated behaviors are on the opposite end of the autonomy continuum. Intrinsic motivation manifests the highest level of autonomy and self-determination. Deci and Ryan (1985) suggested that intrinsically motivated behaviors are engaged for one’s pleasure and satisfaction derived from their performance; they usually happen when people are doing something they are sincerely interested in, engaging in these activities with a full sense of volition. Consequently, curiosity and play become two of the fundamental elements of an intrinsically motivated behavior, which is spontaneous and requires no external compulsions or constraints. Deci, Vallerand, Pelletier, and Ryan (1991) described intrinsically motivated behaviors as “the prototype of self-determination—they emanate from the self and are fully endorsed” (p. 328).

According to SDT, when human beings have opportunities to satisfy their basic needs for competence, relatedness, and autonomy, their behaviors tend to be intrinsically motivated (Deci & Ryan, 1985). The definitions and theoretical aspects of human beings’ innate needs for competence, relatedness, and autonomy in SDT are discussed respectively as follows.

Competence

SDT suggests that one source of human beings’ intrinsic motivation comes from their need to be competent and self-determining (Deci & Ryan, 1985). There is a positive relationship between perceived competence and intrinsic motivation. In other words, when people perceive themselves to be more competent at a certain activity, they will be
more intrinsically motivated at that activity. Deci and Ryan (1985) suggested, however, that there are two necessary conditions for the existence of this relationship. First, the activity must be optimally challenging, because an easy and effortless task cannot possibly intrinsically interest someone, even if they perceive themselves to be extremely competent at that task. Second, as Deci and Ryan stated, “for perceived competence to affect intrinsic motivation, the perceived competence must exist within the context of some perceived self-determination” (pp. 58-59). In other words, people performing a certain task need to feel that their abilities and their actions, doing poorly or well, can somehow affect the circumstance or outcome of the event. Thus, the need for competence encourages people “to seek challenges that are optimal for their capacities and to persistently attempt to maintain and enhance those skills and capacities through activity” (Ryan & Deci, 2002, p. 7). In one of Deci’s (1971) primitive studies, the subjects in the experiment group, who received positive feedback and presumably perceived themselves to be more competent, were more intrinsically motivated to do their subsequent task as compared to the subjects receiving no feedback. Deci et al. (1991) summarized that “competence involves understanding how to attain various external and internal outcomes and being efficacious in performing the requisite actions” (p. 327).

SDT also suggests that the need for competence and the intrinsic motivation energized by this need represents an instance of cross-domain behavioral tendency, which states that individuals tend to become more focused and specialized as they interact with the environment (Deci & Ryan, 1985; Deci & Ryan, 2000). Thus, the need for competence aligns with the adaptive nature of human beings, which urges individuals to learn from their own or others’ experiences, develop their unique talents, and maximize
the talents in niche-relevant ways. The curious and assimilative nature of the process to satisfy individuals’ need for competence also makes them become more skillful and effective. To this end, Deci and Ryan (2000) concluded that the striving for competence can be seen as “the route to actualizing specific adaptive competencies and to the flexible functioning of human groups in the context of changing environmental demands” (p. 253).

**Relatedness**

Relatedness is defined as a person’s need to feel connected to others, to care for and be cared by others, and to have a sense of belonging with other individuals and one’s community (Deci & Ryan, 1985). Ryan and Deci (2002) suggested human beings’ need for relatedness “reflects the homonomous aspect of the integrative tendency of life, the tendency to connect with and be integral to and accepted by others” (p. 7). SDT supposes that the need for relatedness is not concerned with external outcome or status, but it reflects one’s psychological sense of connection to others in secure communion or unity. Along these lines, Deci et al. (1991) asserted that “relatedness involves developing secure and satisfying connections with others in one’s social milieu” (p. 327).

In contrast to the results of human beings’ need for competence being satisfied, which often leads to individuals’ specialization and effectiveness, SDT suggests that the need for relatedness demonstrates the tendency toward reciprocal altruism, meaning that a person longs to cohere with one’s group, to feel connection and caring, to internalize group needs and values, and to contribute one’s own special talent to the group (Deci & Ryan, 1985; Deci & Ryan, 2000). Therefore, the satisfaction of individuals’ need for relatedness may ultimately lead to a higher level of a group’s adaptive advantage and
survival (Deci & Ryan, 2000; Sheldon & Elliot, 1999). However, insofar as the need for relatedness emphasizes the larger social entity rather than individuals, it can at times compete with individuals’ need for autonomy (Ryan, Kuhl, & Deci, 1997). Thus, under optimal circumstances, the process to satisfy one’s need for relatedness should benefit the individual when the beliefs and values adopted by the social organization do not conflict with one’s autonomy but are well-internalized within oneself (Deci & Ryan, 2000). For this purpose, Deci and Ryan (2000) asserted that the need for relatedness “provides a motivational basis for internalization, ensuring a more effective transmission of group knowledge to the individual and a more cohesive social organization” (p. 253).

**Autonomy**

Autonomy is the most critical psychological need to promote self-determination and intrinsic motivation. Without the need for autonomy being satisfied, a person cannot possibly be intrinsically motivated even if the other two needs, competence and relatedness, are satisfied (Deci & Ryan, 1985). Deci et al. (1991) simply defined autonomy as “being self-initiating and self-regulating of one’s own actions” (p. 327), which is indeed the origin of human beings’ intrinsic motivation. SDT suggests that when people act with autonomy, they perceive themselves to be the origin of their own behaviors and act according to their interests and integrated values, such that an autonomous behavior is an expression of the self. Therefore, when the need for autonomy is satisfied, an individual does not feel forced by outside influences but initiates the action according to one’s own beliefs and values. SDT also distinguishes autonomy from independence (i.e., relying on no external sources or influences) and suggests that they are two separate and orthogonal constructs (Deci & Ryan, 1985). For instance, sometimes
a person receives others’ influences but still behaves autonomously in accordance with one’s own endorsement; it is also possible that a person relies on others and becomes controlled by the outside influences, behaving with no autonomy.

SDT also refers to the need for autonomy as self-organization or self-regulation, and both terms convey the idea of human beings’ adaptive advantage as they process and specify their personal needs in relation to environmental affordances (Deci & Ryan, 1985; Deci & Ryan, 2000). In other words, when an individual is autonomous, the person has the ability to organize one’s personal needs in response to exogenous circumstances and then make the best decision according to one’s own beliefs. During the process of integrating social contexts and making self-determined decisions, an individual can better regulate one’s own actions according to one’s needs and available capacities. Thus, Deci and Ryan (2000) suggested that the process of coordinating and prioritizing one’s own needs and capacities to achieve autonomy indeed results in more effective self-maintenance of the person. They further asserted that autonomy is essential to any effective behavioral regulation across domains and developmental stages, and thus the development of autonomy is a reflection of human beings’ natural tendency toward self-coherence and the avoidance of self-fragmentation.

*Extrinsic Motivation and Internalization*

The essential difference between extrinsically and intrinsically motivated behaviors is the source that energizes and directs the activity, even though the behaviors may sometimes look exactly the same. In contrast to intrinsically motivated behaviors, which emanate from a person’s inner interests, curiosities, or needs, the sources of extrinsically motivated behaviors are outer events that are taking place in the
environment (Deci & Ryan, 1985). Ryan and Deci (2000) simply distinguished the two terms, asserting that “the term extrinsic motivation refers to the performance of an activity in order to attain some separable outcome and, thus, contrasts with intrinsic motivation, which refers to doing an activity for the inherent satisfaction of the activity itself” (p. 71). Inevitably, it is impossible for human beings to do only those things that they are interested in. The reality is that there are many things that are not interesting enough to intrinsically motivate people, but these activities are so important in the social context that people need to learn to accept them and behave accordingly. Therefore, unlike many other motivation theories, SDT suggests that depending on how people process and value a certain external contingency, extrinsically motivated behaviors may potentially be self-determined and autonomous. The psychological process as an individual responds to external contingencies is conceptualized as the process of internalization (Deci & Ryan, 1985).

SDT is not the first theory that conceptualizes the process of internalization. Traditionally, internalization has been considered as a process when people transform regulations by external contingencies into regulations by internal processes (Schafer, 1968). In SDT, internalization is conceptualized as a motivated process, assuming “(a) that people are inherently motivated (out of the three basic needs) to internalize and integrate within themselves the regulation of uninteresting activities that are useful for effective functioning in the social world and (b) that the extent to which the process of internalization and integration proceeds effectively is a function of the social context” (Deci, Vallerand, Pelletier, & Ryan, 1991, pp. 328-329). Ryan (1995) briefly described the process of internalization as “the active assimilation of behavioral regulations that are
originally alien or external to the self” (p. 405). To this end, SDT attributes the factors influencing individuals’ internalization process first to their immediate social contexts and then to their developmental environments. When individuals’ inner needs for competence, relatedness, and autonomy are nurtured by these factors, they may be able to fully assimilate their regulations, so that their extrinsically motivated actions may be self-determined, unalienated, and authentic (Ryan & Deci, 2000). The sub-theory from SDT, known as the organismic integration theory (OIT), categorizes all extrinsically motivated behaviors into four kinds according to the level of internalization. Sorted from the least to the greatest amount of autonomy, they are external, introjected, identified, and integrated regulation.

External regulation

Externally regulated behaviors are the least autonomous behaviors among all of the extrinsically motivated behaviors. At this stage of extrinsic motivation, the behavior is solely performed because of an external contingency or some possibility of reward, but none of these extrinsic motivators are internalized by the person. Thus, behaviors are initiated and regulated externally; a person performs an externally regulated behavior just to avoid potential penalties or to get potential rewards. In terms of the perceived locus of causality, externally regulated actions are always perceived to have an external locus of causality. An example of external regulation is when a student studies in order to receive a good grade and the teacher’s praise, or to avoid punishment for missing the deadline of an assignment. As a result, Deci, Vallerand, Pelletier, and Ryan (1991) asserted that “external regulation represents the least self-determined form of extrinsic motivation” (p. 329).
Introjected regulation

Behaviors regulated by introjected contingencies occur when a person takes in the outside demands and rules but does not accept them as one’s own. While internalizing these demands and rules, the person acts to avoid the threatened sanctions or to comply with one’s internal coercion. Even though introjected regulations are taken into the person, they are not integrated into the self or considered to be self-determined; the person does not identify with the regulation but has to comply without a choice. An example of introjected regulation is when a student studies to avoid feeling like a bad student. To this end, introjected regulation still has the perceived external locus of causality, because it “bears more resemblance to external control than to self-determined forms of regulation because it involves coercion or seduction and does not entail true choice” (Deci, Vallerand, Pelletier, & Ryan, 1991, p. 329).

Identified regulation

In a stage of identified regulation, a person accepts and identifies with the extrinsically regulatory process, so that it becomes more of a part of the self. Thus, the person can do the activities more willingly and feel a sense of volition or choice regarding the behavior. To this end, behaviors regulated by identified contingencies are considered relatively more autonomous or self-determined than behaviors regulated by external or introjected contingencies. An example of identified regulation is that a student studies because he or she thinks that it is important or useful to have the knowledge being taught by the teacher. When the regulatory process is identified by the person, the perceived locus of causality is internal to the person, because the behavior is performed willingly for personal understanding rather than external pressures. Nonetheless, the
motivation is still extrinsic, because the activity is performed primarily because of its usefulness or instrumentality for some certain goals, rather than being interesting to the person.

*Integrated regulation*

Integrated regulation is the most developmentally advanced form of extrinsic motivation. At this level of the internalization process, a person can fully integrate the regulatory process with one’s coherent sense of self, meaning the identifications are “reciprocally assimilated with the individual’s other values, needs, and identities” (Deci, Vallerand, Pelletier, & Ryan, 1991, p. 330). Therefore, behaviors regulated by integrated contingencies can represent the values and beliefs of a person and reveal what is important to the person. An example of integrated regulation is when a student studies because he or she truly values the importance of knowledge and makes a decision to work hard to gain this knowledge. Therefore, the locus of causality of integrated regulation is internal to an individual. Since integrated regulation shares some similar characteristics with intrinsic motivation, such as being autonomous and self-regulated, they often generate the same quality of behaviors—willingness, creativity, and expression of conceptual or intuitive understanding. However, SDT distinguishes integrated regulation from intrinsic motivation based on their different motivational sources, meaning “intrinsic motivation is characterized by interest in the activity itself, whereas integrated regulation is characterized by the activity’s being personally important for a valued outcome” (p. 330).
Definition of Teacher Motivation

Research on teacher motivation has expanded over the past decade (Bishay, 1996; Eren & Tezel, 2010; Morcom & MacCallum, 2010; Roness, 2011; Schondeld, 1990; Schutz, Crowder, & White, 2001; Skaalvik & Skaalvik, 2011). Given the numerous dimensions of teacher motivation, studies have focused on different components of teacher motivation, such as prospective teachers’ motivation to enter the teaching profession (Eren & Tezel, 2010; Schutz, Crowder, & White, 2001), in-service teachers’ motivation related to their daily work (Roness, 2011; Schondeld, 1990; Skaalvik & Skaalvik, 2011), and characteristics or influences of a motivated teacher (Bishay, 1996; Morcom & MacCallum, 2010). Although these recent studies may not consistently adopt the same definition of teacher motivation, they are all essentially related to the present study. Therefore, in order to depict a full picture of teacher motivation, the following section briefly reviews literature that has defined teacher motivation from different perspectives and how they are related to SDT.

Motivation to Teach

In accordance with SDT (Deci & Ryan, 1985), one premise of the present study is that prospective teachers often enter the teaching profession because they are intrinsically motivated or extrinsically motivated with integrated regulation. Both of these regulatory processes are fully self-determined and autonomous. Factors that motivate individuals to become teachers have always been an important area of educational research in order to investigate the problem of teacher shortages and teacher quality (Ingersoll, 2008; Zumwalt & Craig, 2008). However, literature has recognized that the motivation to choose the teaching profession cannot be reduced to a single reason (Brookhart &
Freeman, 1992; Lortie, 1975; Mori, 1965). For instance, Lortie (1975) suggested that there are five different aspects emerging as the attractions of teaching, including interpersonal, service, continuation, material, and time compatibility. Nonetheless, literature has suggested that many prospective teachers choose the teaching profession for various reasons that follow a similar theme of values or beliefs, such as competence, intrinsic career value, and social contribution (Lortie, 1975; Roness, 2011; Sahlberg, 2010; Schutz, Crowder, & White, 2001; Watt & Richardson, 2007). With regard to competence, prospective teachers believe that they possess essential teaching skills of an effective teacher. Consequently, they choose teaching as a career that suits their ability (Eren & Tezel, 2010). Second, prospective teachers’ belief in their teaching capability essentially satisfies their need for competence and manifests their intrinsic motivation. With regard to intrinsic career value, prospective teachers often state that they enjoy teaching, like working with children or adolescents, or have always desired to be a teacher, which are all considered as clear expressions of their self-determination and intrinsic motivation (Eren & Tezel, 2010; Roness, 2011; Sahlberg, 2010). For instance, the survey results on the basis of 137 Norwegian teachers revealed that they strongly agree that they became teachers because it is an exciting and enjoyable profession (Roness, 2011). Lastly, prospective teachers often indicate that they choose the teaching profession as a means to ‘give back’ to society and enhance social equity (Eren & Tezel, 2010). The goal of serving and contributing to the community aligns with the integrated regulation theorized in SDT, in which prospective teachers show a well-internalized regulatory process and choose to act on their beliefs of social equity and societal perpetuation. Literature has also referred to this type of service-oriented goal of
prospective teachers entering the teaching profession as an altruistic motivation (Brookhart & Freeman, 1992; Spear, Gould, & Lee, 2000). For instance, the survey results conducted by Roness (2011) demonstrated that teachers strongly agree that they become teachers because they want to work with young people and help children and youth in their development and formation as human beings.

In summary, personal goals of prospective teachers are intrinsic, and their motives are autonomous as expected with SDT. Undeniably, some teachers are extrinsically motivated to enter the profession with less self-determination, such as concerns about working hours, locations, and job security (Roness, 2011). The present study emphasized the potential factors that promote in-service teachers’ autonomous motivation, such as intrinsic motivation and integrated regulation, for two reasons: (1) Existing literature has suggested that in-service teachers’ autonomous or self-determined motivation results in teachers’ higher satisfaction and well-being (Eyal & Roth, 2011; Schondeld, 1990); (2) Autonomously motivated teachers tend to motivate their students to be more self-determined which results in more effective teaching and learning (Lovat, Toomey, Clement, Crotty, & Nielsen, 2009; Wood, 2001). Further details of the potential benefits of a motivated teacher with self-determination are discussed in the next section. Since teachers’ autonomous motivation was emphasized in this study, the autonomy-supportive motivating factors were hypothesized to have a positive effect on their motivation (Deci & Ryan, 2000; Vansteenkiste, Lens, & Deci, 2006).

Influence of a Motivated Teacher

One premise of the present study is that autonomously motivated teachers benefit teaching, learning, and the education system as a whole. Thus, this section provides
evidence of a motivated teacher’s influence in order to support the necessity of investigating potential factors that increase teacher motivation. Even though literature has greatly supported the positive effect of teacher quality on student learning and achievement (Creemers, 1994; Goddard, Hoy, & Hoy, 2000; Heck, 2007; Sanders & Rivers, 1996; Scheerens & Bosker, 1997), the direct benefits of teacher motivation on student achievement have not been well supported (Bishay, 1996). Nonetheless, literature has suggested at least three potential benefits of teachers’ autonomous or self-determined motivation.

First, insofar as teachers’ main responsibility is to focus students’ attention toward learning and evoke students’ interest in the curriculum, teachers’ enthusiasm in daily activities has a significant influence on students’ motivation levels (Deniz, Selahattin Avşaroğlu, & Fidan, 2006; Kocabaş, 2009). Rothman (1981) suggested that teachers serve as educators to deliver knowledge and to act as students’ role models. When teachers are motivated and self-determined, students’ self-determination is promoted correspondingly, which leads to higher creativity, cognitive flexibility, and self-esteem (Deci, Vallerand, Pelletier, & Ryan, 1991). Peck, Fox, and Morston (1977) also found that teachers’ positive attitude significantly increases students’ self-esteem.

Teachers are responsible for cultivating students’ capacity for deliberative democracy, which requires them to be critically reflective and to act based on their own conscience (Gutmann, 1987). Thus, motivated teachers are capable of preparing students to participate in a democratic society. Wood (2001) asserted that “those teachers who have developed as autonomous professionals are more likely to help children develop a sense of autonomy” (p. 42). Pelletier, Seguin-Levesque, and Legault (2002) further
suggested that teachers’ autonomous motivation leads to autonomy-supportive teaching. For this reason, Gokce (2010) asserted that “teachers who do not have adequate knowledge of the subject of motivation and who are not motivated themselves will have difficulty motivating their students to learn” (p. 497). In addition, the effect of teacher and student motivation in teaching and learning has been found to be reciprocal, meaning that when teachers effectively motivate students towards more mature participation in learning, teachers may better connect with their students and be more motivated and reinvigorated with a sense of purpose and meaning (Lovat, Toomey, Clement, Crotty, & Nielsen, 2009; Morcom & MacCallum, 2010). On the basis of the close relationship between teacher motivation and student motivation, several studies have implied that teachers demonstrating higher motivation are more likely to have higher achieving students (Bandura, 1993; Gokce, 2010; Urdan & Turner, 2005; Zimmerman, 2000).

Second, literature has suggested that teachers’ intrinsic motivation encourages them to pursue the process of professionalization (Dzubay, 2001). Teacher professionalization is the process whereby teachers continue to move upward in terms of their status, training, working conditions, credentials, induction, professional development, authority, and compensation (Ingersoll, Alsalam, Quinn, & Bobbitt, 1997). Teacher professionalization often happens when teachers are able to practice autonomy in their career and connect or collaborate with other colleagues; conversely, forced participation often infringes upon teachers’ self-determination and subsequently discourages them from professionalization (Dzubay, 2001). Even though the reasons for professionalization may vary across teachers, literature has supported that teacher professionalization usually occurs when teachers are intrinsically motivated and desire to
improve teaching practices and strengthen their own teaching skills (Hildebrandt & Eom, 2011). Therefore, teacher motivation is considered to benefit teachers themselves in terms of pursuing the process of professionalization.

Third, schools and the education system as a whole benefit from motivated teachers. Insofar as teachers’ motivation potentially decreases burnout and tendencies to leave the teaching profession (Roness, 2011), motivated teachers staying in the profession are indeed considered as valuable assets to schools (Johnson, 2011). Johnson (2011) suggested that losing any in-service teacher costs schools’ money, time, and effort to find a replacement and to prepare a new person to enter that classroom. To this end, teacher motivation not only benefits students’ learning and teachers’ own professionalization, motivated teachers also create a strong and dependable foundation for the whole education system. Consequently, potential factors that increase teachers’ motivation are important and worth investigating.

**Manifestation of a Motivated Teacher**

Within the existing literature, in-service teachers’ autonomous motivation appears to be manifested in three different areas: resilience, integrated regulation, and commitment. This section introduces each sub-construct.

**Resilience**

Teaching may be considered as one of the most stressful professions (Stoeber & Rennert, 2008). Teachers’ work-related stress has been investigated in various studies and is considered to be caused by multiple sources, such as schools, students, parents, and colleagues, in instructional, social, and emotional dimensions (Blase, 1982; Galbo, 1983; Skaalvik & Skaalvik, 2011). Even though teachers enter the profession with an
enthusiasm and passion to teach, there is potential that they may get worn out after several years of teaching (Lortie, 1975). Literature has demonstrated that some teachers who have been teaching for many years may no longer experience their work with the same enthusiasm, excitement, sense of mission, and challenge; instead, teaching becomes just a routine and daily compliance to the school structure (Gutmann, 1987). One of the most extreme cases for teachers losing their motivation to teach is the concept of burnout, which has been used to describe feelings of emotional exhaustion, depersonalization, and reduced personal accomplishment resulting from frustration at work (Leithwood, Menzies, Jantzi, & Leithwood, 1999; Maslach & Jackson, 1984). Emotional exhaustion and depersonalization have often been used as two core elements to gauge teachers’ perception of job burnout (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Maslach & Jackson, 1986). Simply stated, when teachers feel emotionally drained from work, or when they lose their passion and become indifferent to their work, they appear to be no longer motivated at work.

On the contrary, teachers’ resilience at work can be considered as one manifestation of their autonomous motivation (Eyal & Roth, 2011; Ryan, 1995). According to SDT (Deci & Ryan, 1985), an individual who acts with full self-determination, either in a form of intrinsic motivation or integrated regulation, usually appears to be fully engaged in teaching activities. Researchers have identified intrinsically motivated behaviors as being spontaneous and as a manifestation of the idea that “organisms innately strive to exercise, expand, and coordinate their knowledge and experience by seeking out challenges in their environments” (Elkind, 1971; Ryan, 1995, p. 404). Ryan (1995) further suggested that because intrinsically motivated behaviors is
an expression of a person’s innate organismic propensity to assimilate and actualize its functioning, they appear as a fully self-regulated action with dedicated engagement and unconflicted expression of the self. Relatedly, several studies have focused on the phenomenological experience of intrinsically motivated behavior (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2005; Reeve, 1996). These studies have revealed that when people fully engage in autotelic activities, they show less anxiety about failing or losing control, and they tend to forget time, fatigue, and everything else but the task itself. Therefore, as these descriptions are applied to teachers, motivated teachers should be more resilient, maintaining the passion they had at the beginning of their teaching career and experiencing less exhaustion or burnout. Empirically, studies have found that when teachers are autonomously motivated, they tend to generate greater effort and feel more energetic rather than feeling drained or exhausted (Eyal & Roth, 2011; La Guardia, Ryan, Couchman, & Deci, 2000). In addition, existing literature has demonstrated autonomously motivated teachers’ resilience with the expression of gratification rather than frustration at work (Sylvia & Hutchinson, 1985).

**Integrated regulation**

According to SDT (Deci & Ryan, 1985), integrated regulation is the most developmentally advanced level in the internalization process because at this integration stage, individuals are fully self-determined and autonomous even though they are extrinsically motivated. For this reason, integrated regulation can be considered as one manifestation of teachers’ autonomous motivation. Since teachers join the profession for an altruistic reason in order to serve society and enhance social equity (Brookhart & Freeman, 1992; Eren & Tezel, 2010; Sahlberg, 2010; Spear, Gould, & Lee, 2000), they
may be more autonomously motivated if they continue to integrate school values with their own goals, values, and beliefs. When teachers fully integrate school values, they can feel that the prevailing norms and values of the school are compatible with their own values; such experience has been referred to as contextual consonance (Rosenberg, 1979). On the contrary, teachers may experience contextual dissonance when they feel the prevailing norms and values of the school are incompatible with their own values (Rosenberg, 1979). The phenomenon of how teachers integrate school values can also be conceptualized by the person-organization fit, which suggests that employees and their organization are compatible when at least one entity can satisfy the other’s needs, or they share similar characteristics (Kristof, 1996). In any case, teachers’ integrated regulation occurs when they fully integrate school values with their own goals and beliefs, and such integration increases their feeling of belonging (Kristof, 1996; Rosenberg, 1979; Skaalvik & Skaalvik, 2011).

Literature has suggested that teachers exercise more autonomy and self-determination when they successfully integrate values, beliefs, and goals of their schools (Smylie, Lazarus, & Brownlee-Conyers, 1996), and such integration may drive teachers to realize their authentic self and promote self-actualization (Bass & Riggio, 2006). Skaalvik and Skaalvik (2011) conceptualized teachers’ integrated regulation of school values as value consonance, and they suggested that greater value consonance results in teachers’ greater sense of belonging and job satisfaction. In this way, even though teachers’ job satisfaction and motivation are two different constructs by definition, teachers’ job satisfaction has been considered closely related to their integrated regulation (Skaalvik & Skaalvik, 2011). In addition, teachers’ satisfaction at work has been
measured by the level of their “psychological rewarding” when they are involved in school activities that lead them to high levels of concentration, immersion, strength, and control (Bishay, 1996; Csikszentmihalyi, 1990). This stage of teachers’ job-related satisfaction aligns with the manifestation of self-determination and intrinsic motivation. In summary, teachers’ job satisfaction is an index of their morale and intrinsic motivation (Schondeld, 1990).

Commitment

A growing body of literature has focused on factors that potentially promote continual motivation and retention of in-service teachers and addressed the issue of teacher shortage and attrition (Ingersoll, 2008; Roness, 2011; Schondeld, 1990; Skaalvik & Skaalvik, 2011). Teachers’ commitment to stay in their current school or to the teaching profession aligns with SDT (Deci & Ryan, 1985) as a manifestation of their autonomous motivation. For instance, in Roness’ (2011) longitudinal study on Norwegian teachers, he concluded that the most important factors motivating teachers to stay in the profession is their subject-matter interest and intrinsic motives. He further suggested that in order to encourage teachers to continue teaching, the education system needs to help build a professional teacher identity by focusing on subject matter and emphasizing intrinsic motivators. Kaufman (1984) suggested that when teachers are intrinsically motivated, they tend to be more committed to teaching. More recent studies have further suggested that teacher retention may be considered as evidence indicating that an in-service teacher is still motivated (Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Skaalvik & Skaalvik, 2011). Specifically, these studies have demonstrated that teachers’
intrinsic motivation is negatively correlated with their intention to leave their current jobs or even the teaching profession.

Potential Motivators at the Personal Level

Literature concerning potential factors that affect teacher motivation has been expanding in recent years (Eren & Tezel, 2010; Hildebrandt & Eom, 2011; Kocabaş, 2009). On the one hand, several factors found to significantly affect teacher motivation are at the teachers’ personal level, such as their personal beliefs on teaching and their perception of their working conditions (Kocabaş, 2009; Skaalvik & Skaalvik, 2011; Weiss, 1999). In Kocabaş’s (2009) study, for instance, the survey results based on 225 teachers from various areas revealed that teachers’ perceived levels of attraction to the teaching profession, perception of their competence in their fields, perception of their status in society, and sense of self-fulfillment positively affect their motivation to teach.

On the other hand, several factors found to significantly affect teacher motivation are at the school level, such as principals’ leadership styles and school environment (Kocabaş, 2009; Pop, Dixon, & Grove, 2010). In the next section, the factors considered to influence teacher motivation at the personal level are reviewed. Potential school-level factors are reviewed in the succeeding section.

On the basis of SDT (Deci & Ryan, 1985) and the hypotheses of the present study, the potential personal-level motivators are separated into two categories according to their different nature as motivational sources. The factors in the first category, including teachers’ content competency, perceived collaboration, and perceived school support, appear to be congruent to the psychological needs for self-determination in SDT. Thus, these factors were hypothesized to promote teachers’ intrinsic motivation or integrated
regulation (Hypothesis 1). The factors in the second category, including base salary and bonus pay, are considered as external rewards. Therefore, these factors were hypothesized to be ineffective to promote teachers’ intrinsic motivation or integrated regulation (Hypothesis 2).

**Autonomy-Supportive Motivators**

Teachers’ content competency, perceived collaboration with colleagues, and perceived support from school were hypothesized to positively affect teacher motivation (Hypothesis 1), because these motivators align with teachers’ innate needs for competence, relatedness, and autonomy. The characteristics of these constructs and potential influences on teacher motivation are reviewed respectively.

**Content competency and highly qualified teacher (HQT)**

Theoretically, SDT (Deci & Ryan, 1985) suggests that self-competence enhances a person’s intrinsic motivation and self-determination. This relationship has also been examined particularly for teachers’ self-competence and their intrinsic motivation (Sylvia & Hutchinson, 1985). For instance, on the basis of a survey completed by 135 teachers, Sylvia and Hutchinson (1985) found that teachers’ self-competence, along with trust and respect, accounts for 22.6% of the variance in their attitudes toward work motivation. In addition, a growing body of literature has also focused on the concept of teachers’ self-efficacy and its relation to teacher quality, effectiveness, and motivation (Cagle & Hopkins, 2009; Tschannen-Moran, Hoy, & Hoy, 1998). Self-efficacy is an individual’s perception of their task-related ability to reach a high level of performance (Bandura, 1997). Along these lines, teachers’ self-efficacy has been defined as “the teacher’s belief in his or her capability to organize and execute courses of action required to successfully
accomplish a specific teaching task in a particular context” (Tschannen-Moran, Hoy, & Hoy, 1998, p. 233). To this end, literature has suggested that teachers’ self-efficacy has a strong correlation to their intrinsic motivation (Fernet, Senécal, Guay, Marsh, & Dowson, 2008) as well as a positive effect on their participation in professional learning, which subsequently increases the quality of instruction and student achievement (Goddard, Hoy, & Hoy, 2000; Ware & Kitsantis, 2007; Wheatley, 2002).

Teachers’ content competency has emerged as one of the essential components of their self-efficacy particularly from the studies focusing on the preparation and effectiveness of math and science teachers (Appleton, 1995; Ma, 1999; Palmer, 2001). Ma (1999) suggested that a math teacher needs to possess profound understanding of the fundamental mathematics connected to and grounded in the curriculum. In addition, it has been demonstrated that preservice science teachers tend to have a higher level of self-efficacy because they are equipped with more content knowledge and how to teach the content (Appleton, 1995; Palmer, 2001). Therefore, on the basis of the intertwined relationship among teachers’ content competency, self-efficacy, and motivation, it was hypothesized in the present study that teachers’ content competency may potentially increase their intrinsic motivation.

One of the most popular issues emerging from the No Child Left Behind Act of 2001 (NCLB) is the policy concerning highly qualified teacher (HQT), which indeed focuses on teachers’ content competency. Even though the criteria of HQT have been criticized as oversimplified in its definition of an effective teacher (Dilworth, Aguerrebere, & Keller-Allen, 2006), the requirement of HQT emphasizes teachers’ content knowledge and ability to offer quality teaching in the classroom (U.S.
Under NCLB, a teacher may have HQT status if the individual has a degree in a relevant subject area, holds at least a standard license, and can show competence of subjects taught (U.S. Department of Education, 2004). Even though the definition of content competency may not be exactly the same across states, teachers typically demonstrate the content competency by passing a state mandated academic subject test and by successfully completing an academic major, an advanced degree, or coursework equivalent to an undergraduate major or advanced certification (Plecki & Loeb, 2004). Theoretically, the HQT policy under NCLB presumes that teachers with qualified content competency may demonstrate their confidence, carry out their abilities, and consequently provide high quality instruction in every classroom (U.S. Department of Education, 2004). Thus, the presumably positive effect of teachers’ HQT status and corresponding content competency on their motivation is supported by SDT, which suggests that competence increases individuals’ intrinsic motivation (Deci & Ryan, 1985).

Even though teachers’ content competency, measured by HQT status, and its influence on teacher motivation has not been extensively investigated, several empirical studies have shed some light on this matter (Cagle & Hopkins, 2009; Wei & Gimbert, 2012). On the basis of the 2007-08 Schools and Staffing Survey data completed by 140 principals and 770 teachers from the sampled schools in Ohio, Wei and Gimbert (2012) found that teachers with HQT status are more intrinsically motivated as compared to their colleagues without HQT status. In addition, Cagle and Hopkins (2009) demonstrated that highly qualified teachers may require a supportive school environment to further increase their self-efficacy, so that they may be both competent and motivated. Cagle and Hopkins
asserted that being both highly qualified and highly motivated makes a teacher persistent and resilient at work. Accordingly, teachers’ content competency was measured by their HQT status in this study and hypothesized to have a positive effect on teacher motivation.

Perceived collaboration

On the basis of SDT (Deci & Ryan, 1985), teachers’ perceived collaboration with colleagues may satisfy their needs for competence and relatedness. Literature has suggested that collaboration among teachers provides opportunities for them to work together to solve problems, provide feedback, and exchange ideas; these opportunities to work with cooperative colleagues may provide pedagogical, emotional, or psychological support for teachers’ work (Little, 1987; Rosenholtz, 1991; Timperley & Robinson, 1998). As teachers share and work with each other, they may be able to learn and try new strategies in their classrooms (Hargreaves, 1992), which may promote their competence in teaching. In addition, interpersonal relationships built while collaborating potentially help teachers relate to their colleagues and satisfy their need for relatedness. For this reason, Dzubay (2001) suggested that teacher collaboration reinforces the psychological needs for relatedness among teachers.

Historically, individualistic and balkanized cultures have been two of the most pervasive forms of teacher culture (Hargreaves, 1992). In a traditionally individualistic culture, teachers are tied to their respective classrooms and are isolated from their colleagues. Consequently, they have little time or opportunity to exchange their teaching experiences or pedagogical ideas with other teachers. Lortie (1975) described this type of segregated classrooms as an ‘egg-crate-like structure,’ in which teachers tend to develop the characteristics known as presentism, conservatism, and individualism. Thus, the
individualistic teacher culture not only aggravates teachers’ feeling of isolation but also hinders their pedagogical creativity. In a balkanized culture, on the other hand, teachers work separately most of the time, but occasionally they work with others within a certain group, department, or clique to compete for power, status, or resources (Hargreaves, 1992). Even though teachers interact with colleagues in the midst of these competing territorial claims, the balkanized teacher culture rarely helps teachers attain a common goal across the board, nor does it lead to any pedagogical change or school improvement.

Given the disadvantages of individualistic and balkanized cultures, a collaborative culture of teachers has been considered to be the most compatible with the interest of local curriculum development and the exercise of autonomous professional judgment (Hargreaves, 1992). Hargreaves (1992) further highlighted some advantages of a collaborative culture of teachers, including that it fosters an environment of openness, trust, and support between teachers and their colleagues; it reinforces teachers’ collective expertise and endeavors of the teaching community; and it values both teachers’ professional and personal well-being. To this end, literature has suggested that a collaborative culture of teachers cannot be contrived, forced, or imposed, but it should rather be naturally developed, spontaneous, development-oriented, and pervasive across time and space (Hargreaves, 1992).

Empirical evidence has supported the benefits of collaborative activities among teachers, such as assisting professional learning and improving teaching practices when the collaboration focuses on student learning (Boling & White, 2007; Bryk, Camburn, & Louis, 1999; Munthe, 2003; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006). In addition, several studies have also demonstrated the specific relationship between teacher
collaboration and their intrinsic motivation (Hildebrandt & Eom, 2011; Kocabaş, 2009; Schondeld, 1990; Skaalvik & Skaalvik, 2011). For example, in a primitive and smaller-scaled study conducted by Schonfeld (1990) on 67 teachers from New York, he measured the construct of colleague support by how much the teachers felt that they could trust their colleagues, comfortably talk and share with them, and work together to solve school-related problems. He found that colleague support may increase teachers’ morale and decrease the psycho-physiologic symptoms caused by job-related stress, such as headaches and stomachaches. In a more recent and larger-scaled study, conducted by Norwegian researchers Skaalvik and Skaalvik (2011) on 2,569 teachers from 127 Norwegian elementary and middle schools, they operationalized the construct of teachers’ relations with colleagues by the magnitude of help from colleagues in education matters, friendliness and concerns for each other, and support for other teachers. They further found that teachers’ relations with colleagues positively affect their sense of belonging and subsequently decrease teachers’ emotional exhaustion and intention to leave the teaching profession. Teachers’ sense of belonging as demonstrated by Skaalvik and Skaalvik aligns with the need for relatedness according to SDT (Deci & Ryan, 1985). In addition, Hildebrandt and Eom (2011) conducted an exploratory factor analysis on the sample data collected from 453 National Board certified teachers in the U.S., and they discovered that collaborative opportunities is one of the five constructs that motivate teachers. On the other hand, they also found that teacher motivation is likely to be negatively affected by a competitive climate among teachers. Their findings seemed to echo the findings of the study conducted by Kocabaş (2009) with 225 Turkish teachers, which revealed that teachers’ positive relationship among their colleagues positively
affects their motivation. Insofar as SDT suggests that the basic need for competence and relatedness are universal across genders and races, the empirical studies on teacher motivation have reaffirmed this by showing that teachers around the world value collaborative opportunities with their trustworthy colleagues, and these collaborative opportunities consequently increase their motivation to teach. For this reason, it was hypothesized in the present study that teachers’ perceived collaboration increases their intrinsic motivation and integrated regulation.

Perceived school support

On the basis of SDT (Deci & Ryan, 1985), teachers’ perceived support from their schools may satisfy their needs for competence and relatedness, so that it is theorized in the present study that teachers’ perceived school support potentially increases their intrinsic motivation. Vandarakis (2004) suggested that ongoing school support for teachers is one of the critical components of classroom success. He argued that the teaching profession is quite different from other desk jobs that can be managed by just one person. Instead, the nature of teaching is a collaboration among educators, administrators, students, parents, and community members. Therefore, teachers must have enough school support in order to thrive in the context of this complex interactive web (Vandarakis, 2004). School support seems essential for teachers’ success as they go through every school event, such as teacher preparation, recruitment, induction, retention, and professional development.

Empirical studies conducted on divergent epistemological foundations have demonstrated the potential effect of teachers’ perceived school support on their motivation from different perspectives (Johnson, 2011; Smith & Ingersoll, 2004; Weiss,
For instance, Weiss (1999) conducted a quantitative study to examine the *Schools and Staffing Survey* national database for 1987-88 and 1993-94, which was collected by the National Center of Education Statistics. On the basis of the statistical analyses, she found that as new teachers felt supported by their workplace conditions during the induction year, they tended to have higher morale and a stronger commitment to teaching. Along the same lines, Smith and Ingersoll (2004) examined survey data from the 1999-2000 *Schools and Staffing Survey* and found a positive relationship between the amount of comprehensive support from school and the rate of retention of new teachers, which is considered one of the manifestations of teacher motivation. From a differing epistemological standpoint, in order to probe teachers’ perspectives on motivation and commitment, Johnson (2011) conducted a qualitative study which consisted of survey questions and in-depth interviews with 15 new teachers in their first year of teaching career at several urban schools in California. She found that school support, such as department meetings, principals’ feedback, mentoring, and coaching, particularly promotes these beginning urban educators’ motivation and commitment to their schools.

Consequently, on the basis of literature and theoretical support by SDT, teachers’ perceived school support was hypothesized to increase their intrinsic motivation and integrated regulation.

**Classroom autonomy**

On the basis of SDT (Deci & Ryan, 1985), teachers’ control over classroom activities aligns with the opportunity to practice their autonomy. When teachers have more control to plan their own classroom activities, such as selecting instructional materials, content to be taught, teaching techniques, and grading policies, they are
granted more freedom or professional discretion that is often referred to as teachers’ professional autonomy (Hargreaves, 2003; Hyslop-Margison & Sears, 2010). Hyslop-Margison and Sears (2010) suggested that teachers’ professional autonomy enhances their responsibility, because it situates them as the primary authors of their own success or failure. This responsibility resulting from the professional autonomy also encourages teachers to “take ownership of their teaching and assume greater personal responsibility for student academic achievement” (p. 2). However, existing literature has suggested that teachers used to have more freedom and control over their classroom activities, but such professional autonomy has been considerably limited under the stress of the prevailing accountability system (Feldmann, 2011; Grenville-Cleave & Boniwell, 2012; Hargreaves, 2003). A lack of professional autonomy may result in teachers’ lack of purpose in the teaching profession, undermine their well-being, and contribute to increasing attrition rates in the teaching profession (Feldmann, 2011). Hargreaves (2003) echoed this point, suggesting that talented teachers tend to reject micro-management under the contemporary teacher accountability system and decide to leave the teaching profession. Empirically, Grenville-Cleave and Boniwell (2012) surveyed 150 teachers and 148 participants from other professions on their perception of control over career activities and well-being, and they found that teachers tend to have lower perceived control as well as lower well-being, which also results in their inadequacy in dealing with changes. On the basis of the existing literature that supports teachers’ professional autonomy, teachers’ classroom autonomy was hypothesized to increase their motivation in the present study.
External Rewards

As incentive pay has rarely been successfully implemented as a teacher compensation policy in the history of U.S. education (Murnane & Cohen, 1986), some concepts from motivation theories may help explain its ineffectiveness. In addition to SDT (Deci & Ryan, 1985), the effect of external rewards on motivation has also been extensively examined by other goal or performance oriented motivation theories, but they have not found a universal rule to use incentives in a manner that always produces the intended outcome (Porter & Lawler, 1968; Vroom, 1964). Nonetheless, since the present study built upon SDT, studies about external rewards in relation to intrinsic motivation were reviewed. On the basis of SDT, Pink (2009) suggested that tangible or monetary rewards often cause seven problems, including diminishing intrinsic motivation, lowering performance, crushing creativity, discouraging good behavior, encouraging unethical behavior like cheating, causing addiction, and fostering short-term thinking. With regard to teacher incentives, the first three problems seem particularly fatal to the implementation and effectiveness of this type of teacher compensation policy.

First, Pink (2009) suggested that ‘if-then’ rewards require people to forfeit some of their autonomy in order to aim toward external rewards. Thus, even though these external rewards may reinforce and control a person’s behavior in the short term, they inevitably undermine the person’s intrinsic interest in the activity itself. Consequently, external rewards hurt people’s intrinsic motivation and enjoyment of the activity in the long term. In the preceding section of literature review on teachers’ motivation to enter the teaching profession, overwhelming evidence has demonstrated teachers’ high level of autonomy and self-determination (Brookhart & Freeman, 1992; Lortie, 1975; Schutz,
Crowder, & White, 2001; Spear, Gould, & Lee, 2000; Watt & Richardson, 2007). For this reason, external rewards may cause long-term damage of teachers’ intrinsic motivation.

Second, external rewards may lower performance (Pink, 2009). For instance, in a recent study in the economic context conducted in the U.S. and in India, researchers found that workers given high-reward incentives perform significantly worse than the low-reward and medium-reward participants in the experiment (Ariely, Gneezy, Loewenstein, & Mazar, 2009). They suggested that performance-related pay potentially discourages employees from working harder and results in worse performance. In the education arena, the concept of teachers’ performance in the classroom is certainly different from workers’ productivity in the business sector. Insofar as teaching is a multifaceted, interdependent, and unpredictable process (Johnson, 1986), the measurement of teacher performance on the basis of student outcomes is indeed far more complex and ambiguous (Malen, Murphy, & Hart, 1987). Thus, the presumed effect of external rewards on teacher performance may be even more difficult to be tested or endorsed.

Third, external rewards are not able to promote creativity (Pink, 2009). In other words, when people are required to complete a heuristic task that demands problem solving skills, novel strategies, or creativity, external rewards often make no difference in terms of the efficiency or effectiveness of them completing the task and solving the problem. With regard to teachers’ daily tasks in the classroom, literature has suggested that the nature of teaching in the classroom is rather complex, dynamic, and it absolutely demands teachers’ discretion and creativity (Black & Wiliam, 1998; Lortie, 1975). Lortie
(1975) asserted that “teachers are involved with knowledge and its diffusion; their work has also been described as an ‘art’ requiring special sensitivity and personal creativity” (p. 28). To this end, external rewards may hinder teachers’ critical thinking and creativity while teaching in the classroom.

Take the Ohio Teacher Incentive Fund (OTIF) as an example of an incentive pay policy implemented on teacher compensation. OTIF was an approximately $20 million fund that the Ohio Department of Education (ODE) received through the Teacher Incentive Fund (TIF) in the 2006-07 school year and aimed to “ensure that highly-quality teachers and school leaders were recognized and promoted, had access to ongoing professional development, worked in collaborative environments, and were compensated appropriately based on skills, knowledge, responsibilities, and student performance” (Raue, MacAllum, Winkler, & Ristow, 2008, p. 1). The grant was first implemented in the four largest urban school districts in Ohio, including Cincinnati, Cleveland, Columbus, and Toledo, during the 2007-08 school year and aimed to implement and evaluate OTIF over a five year period. In order to test alternative models of performance-based compensation, Cleveland and Toledo adopted this incentive fund as district-wide policies, whereas Columbus and Cincinnati only selected a small sample of high-need schools for implementation (Raue, MacAllum, Winkler, & Ristow, 2008). In September 2010, the U.S. Department of Education announced another TIF grant, which was approximately $437 million, offered mainly to small or mid-sized districts who had committed to using incentive pay and accountability data (Battelle for Kids, 2010; U.S. Department of Education, 2010c).
Although several new policies and teacher incentive programs have been emerging in response to the Race to the Top (RttT) funds or TIF, the evaluation of the OTIF implementation has provided some evidence on the effect of teacher incentive pay and teachers’ responses to the policy. For instance, the results from a survey conducted by ODE, which was given to 36 schools within the four OTIF districts, revealed that teachers from the OTIF districts had a low level of understanding about the OTIF initiatives and were unfamiliar with the eligibility criteria or the basis for receiving performance-based awards (Ohio Department of Education, 2008). The results aligned with the existing literature on the ineffectiveness of teacher incentives on teacher motivation (Frohreich, 1988; Ha & Sung, 2011; Murnane & Cohen, 1986; Ramirez, 2001; Sylvia & Hutchinson, 1985). For this reason, it was hypothesized in the present study that external rewards, such as base salary and incentive bonus, are ineffective factors affecting teacher motivation (Hypothesis 2).

Potential Motivators at the School Level

In addition to teachers’ personal-level factors, literature has suggested that some factors that potentially affect teachers’ motivation are at the school level (Cagle & Hopkins, 2009; Kocabaş, 2009; Pop, Dixon, & Grove, 2010; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). For instance, Kocabaş (2009) found that teacher motivation may be promoted by a positive atmosphere in school as well as effective administration and management. Within these school factors, some of the factors are directly associated with administrators’ leadership styles, and the others may be attributed to school environment, which is influenced by principals’ administration. Therefore, understanding the effects of these school factors on teacher motivation may help administrators foster a
school culture that promotes teacher motivation. In the present study, school factors were hypothesized to either influence teacher motivation directly, which causes the difference in average teacher motivation across schools (Hypothesis 3), or moderate the effect of any personal-level factor on teacher motivation (Hypothesis 4). The next section reviews the literature on these school factors, which are categorized into administrator leadership and school environment, and their presumed relations to teacher motivation.

Administrator Leadership

Literature has suggested that managerial control has significant effects on work motivation (Deci, Connell, & Ryan, 1989). In terms of teachers working in the school environment, principals’ leadership becomes one of the most important sources of managerial control. The effect of principals’ leadership styles on teacher motivation has been examined on the basis of various theoretical frameworks, such as on expectancy-based motivation (Finnigan, 2010), on SDT (Eyal & Roth, 2011), and on the basis of multiple motivation theories combined (Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). Even though the present study does not utilize principals’ leadership styles as a predicting factor, it is worthwhile to briefly review the leadership styles that have been investigated in some of the primitive studies in order to demonstrate that certain qualities or characteristics of principal leadership styles potentially promote teacher motivation.

In an early study on leadership style, Lewin, Lippitt, and White (1939) distinguished three types of leadership style: an authoritarian leader who often makes decisions without consulting the subordinates, a democratic leader who encourages group discussion and group decision making, and finally, a laissez-faire leader who often acts passively. In addition, Fleishman and Harris (1962) conceptualized two dimensions of
leadership style. First, the dimension of consideration describes the mutual trust and respect between a leader and his/her group, emphasizing the leader’s deeper concern for the group members’ needs. Second, the dimension of initiation (structure) describes how a supervisor organizes or defines group activities and his/her relation to the group, emphasizing the leader’s overt attempts to achieve organizational goals. Blake and Mouton (1964) further connected the two dimensions of leadership style—consideration and initiation—and the classic labels of leadership style to create the commonly adopted classification of leadership styles: democratic or participative (high consideration and high initiation), human relations (high consideration and low initiation), authoritarian (low consideration and high initiation), and laissez-faire (low consideration and low initiation). Literature has suggested that different types of leadership style may have different influences on subordinates’ motivation (Lewin, Lippitt, & White, 1939; Vroom, 1964). For instance, democratic leaders have been found to effectively encourage group members’ involvement and commitment to their work, and the higher level of participation subsequently increases the group members’ intrinsic motivation (Lewin, Lippitt, & White, 1939). On the other hand, authoritarian leaders have been found to successfully encourage group members’ extrinsic motivation when they skillfully tie rewards to performance so that they often generate higher productivity when the subordinates value external rewards (Vroom, 1964).

Relying on classic literature on leadership style, recent studies have particularly identified the effects of various principals’ leadership styles on school climate and teacher motivation (Eyal & Roth, 2011; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Leithwood, Tomlinson, & Genge, 1996). For instance, Fernet et al. (2008) found that the
effects of principals’ managerial control on teacher motivation are limited to teachers’ particular tasks, such as class preparation, teaching, or class management, especially when the principals exert more influence on these various areas. In the context of current accountability, several studies have also focused on some particular leadership styles of principals that potentially increase student performance (Hallinger & Heck, 1998; Leithwood & Jantzi, 2006; Supovitz, Sirinides, & May, 2010). In these studies, teacher motivation has often been considered as a mediating factor between administrator leadership and student learning. One of the main leadership styles that have been closely investigated is transformational leadership (Eyal & Roth, 2011; Geijsel, Sleegers, Leithwood, & Jantzi, 2003; Hallinger & Heck, 1998; Leithwood, Menzies, Jantzi, & Leithwood, 1999; Ramachandran & Krishnan, 2009). Originally proposed in Burns’ (1978) research on political leadership, the construct of transformational leadership consists of individualized consideration, intellectual stimulation, idealized influence, and inspirational motivation by articulating a clear and justified vision (Avolio, Bass, & Jung, 1999; Bass, 1985). For this reason, transformational leadership has been demonstrated to effectively promote subordinates’ trust, organizational commitment, and job performance (Bono & Judge, 2003; Fuller, Patterson, Hester, & Stringer, 1996). In the education context, a principal with transformational leadership develops a shared vision with teachers, encourages them to try new ideas and practices, and promotes trust and respect (Leithwood, Tomlinson, & Genge, 1996). Green (2010) further suggested that a principal with transformational leadership distributes leadership tasks, empowers followers to make decisions, and creates a school culture that reinforces collaboration. According to SDT (Deci & Ryan, 1985), therefore, the nature of transformational leadership and the
school context fostered by this type of leadership is autonomy-supportive (Gagne & Deci, 2005; Sheldon, Turban, Brown, Barrick, & Judge, 2003). To this end, several empirical studies have aimed to examine the effect of principals’ transformational leadership on teacher motivation (Eyal & Roth, 2011; Finnigan, 2010; Leithwood, Menzies, Jantzi, & Leithwood, 1999). Eyal and Roth (2011) found empirical evidence supporting the idea that principals with transformational leadership increases teachers’ autonomous motivation and subsequently decreases burnout. Conversely, they found that principals with transactional leadership, meaning that they utilize more contingent rewards and monitor subordinates’ work activities more closely (Gagne & Deci, 2005; Sheldon, Turban, Brown, Barrick, & Judge, 2003), tend to increase teachers’ controlled motivation and subsequently increase burnout (Eyal & Roth, 2011).

Finally, instructional leadership is another construct that has emerged from the literature on principals’ transformational leadership (Finnigan, 2010; Kelly, Thornton, & Daugherty, 2005). Instructional leadership has been considered a principal’s role in “providing direction to the school—from articulating a vision, to setting high expectations and monitoring performance” (Finnigan, 2010, p. 166). As instructional leaders, principals are supposed to “foster an understanding of the school vision, facilitate implementation of the mission, and establish the school climate” (Kelly, Thornton, & Daugherty, 2005, p. 18). Finnigan (2010) found that under the high-stakes accountability policies, principals’ instructional leadership and support for change increase teachers’ expectation on their students’ abilities to learn and their own abilities to improve performance. In addition, Cagle and Hopkins (2009) suggested that in order to promote
teachers’ self-efficacy, principals should be instructional leaders and foster a school culture that recognizes excellence and promotes a sense of individual empowerment.

**School Environment**

According to the preceding discussion, principal leadership plays an important role on teacher motivation and student achievement, but much of this effect is considered to be indirect via school environment (Hallinger, 2005; Leithwood, Mascall, Strauss, Sacks, Memon, & Yashkina, 2007; Nettles & Herrington, 2007). Since all teaching and learning is encompassed within the school context, school environment and teachers’ interpersonal relationship within the environment have emerged to be important school-level factors that potentially affect teachers’ job motivation and satisfaction (Kocabaş, 2009; Pop, Dixon, & Grove, 2010; Smylie, Lazarus, & Brownlee-Conyers, 1996). Two of the constructs that have been identified are teachers’ participation in decision making and the opportunities for teachers to participate in professional development.

**Teacher participation in decision making**

The concept of teacher leadership has received more attention from educators over the past decade, which is contrary to the top-down management style in traditional schools but suggests that distributed leadership is a more effective school structure than a bureaucratic one (Elmore, 2000; Reeves, 2008). Teachers exercise their shared leadership by participating in decision making in school activities. Therefore, teacher leadership may be considered a demonstration of teachers practicing their autonomy in schools (Reeves, 2008). Reeves (2008) further suggested that teacher leadership needs to be cultivated in a school environment that promotes teacher efficacy, networks, and evidence-based decision making; while being supported by the accommodating school
environment, teacher leadership may potentially increase faculty morale and student achievement.

The existing literature has provided some evidence supporting the positive effect of teachers’ participation in decision making on their intrinsic motivation (Jongmans, Sleegers, Biemans, & de Jong, 2004; Kocabaş, 2009; Smylie, Lazarus, & Brownlee-Conyers, 1996). Smylie et al. (1996) suggested that in different school cultures, teachers may have different levels of shared influence in decision making processes and consequently different levels of control over school activities. They found that the schools that granted teachers a higher level of participation and shared decision making tended to increase teachers’ ownership of school goals and reinforce the process of teachers internalizing school goals as their personal goals. In addition, literature has also demonstrated that teachers’ participation in decision making or control over school activities increases their self-efficacy and consequently motivates them to continue learning (Jongmans, Sleegers, Biemans, & de Jong, 2004; Smylie, Lazarus, & Brownlee-Conyers, 1996). Nonetheless, Kocabaş (2009) suggested that the effect of teachers’ participation in decision making on their motivation is moderated by their years of experience, and it may be attributed to the fact that school administrators often include more experienced teachers, rather than novice teachers, in the decision making process. Although existing scholarship has demonstrated the potential effect of teachers’ participation in decision making (Kocabaş, 2009; Smylie, Lazarus, & Brownlee-Conyers, 1996), this effect has not yet been examined as a school-level factor that potentially moderates the effect of teachers’ personal-level motivators.
Professional development

Professional development aims to enhance teachers’ pedagogical skills and content knowledge so that they may change practices for better teaching quality and support standard-based inquiry classrooms (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003). Literature has demonstrated that professional development leads to changes in teachers’ beliefs and practices as well as changes in student learning (Garet, Porter, Desimone, Birman, & Yoon, 2001; Hawley & Valli, 1999; Richardson & Roosevelt, 2004). Feiman-Nemser (2001) distinguished the focus of ongoing professional development from the focus of induction for beginning teachers. She argued that during the induction years, professional development programs designed to support beginning teachers should focus on (1) learning the context—the students, the curriculum, and the school itself; (2) learning how to design a responsive instructional program; (3) learning how to create a classroom learning community; (4) enacting a beginning repertoire; and (5) developing a professional identity. On the other hand, ongoing professional development beyond the induction years should focus on (1) extending and deepening subject matter knowledge for teaching; (2) extending and refining repertoires in curriculum, instruction, and assessment; (3) strengthening skills and dispositions to study and improve teachers’ own teaching; and (4) expanding responsibilities and developing leadership skills (Feiman-Nemser, 2001). Similarly, Reeves (2008) suggested that professional development should provide teachers opportunities to directly observe professional practices and further increase teachers’ networking and leadership at their schools.
Literature has also revealed some characteristics that a professional development program should have to benefit teachers and schools, such as being relevant to the problems and issues faced by teachers, being specific and dynamic rather than generic or all encompassing, and being respectful and constructive rather than insulting or judgmental (Vandarakis, 2004). A successful professional development program should also be long-term with follow-ups, so that it may earn teachers’ buy-in and agreement on its vision and goals (Garet, Porter, Desimone, Birman, & Yoon, 2001; Hawley & Valli, 1999).

Several empirical studies have provided evidence that an effective professional development program may enhance the quality of teachers’ instruction in classrooms (Kardash, 2000; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). For instance, Thoonen et al. (2011) found that teachers who are more engaged in professional learning activities tend to have better teaching practices and higher quality instruction. In addition, Kedish (2000) found that professional development experiences may increase teaching quality as well as student achievement. Nonetheless, the potential effect of teachers’ professional development experiences on teachers’ intrinsic motivation has not yet been extensively examined (Pop, Dixon, & Grove, 2010). Theoretically, as professional development programs aim to provide teachers opportunities to increase their pedagogical or content competency and to collaborate with other teachers (Feiman-Nemser, 2001), professional development experiences potentially satisfy teachers’ psychological needs for competence and relatedness, as conceptualized in SDT (Deci & Ryan, 1985). In addition, Vandarakis (2004) suggested that when professional development programs are designed appropriately with clear goals, logical times, and
materials designed specifically for school needs, these experiences may enhance schools and teachers’ autonomy. For this purpose, Pop, Dixon, and Grove (2010) examined 67 teachers’ motivation and change of practices as they participated in a six-week summer professional development program. They found that professional development experiences have some significant effects on teacher motivation and practices, but the effects may differ between elementary and secondary teachers. Accordingly, the present study considered teachers’ participation in professional development as a school-level factor and examined its moderating effect on individual teachers’ intrinsic motivation.

Summary of Literature

The present study constructed its theoretical framework regarding teacher motivation on the basis of Deci and Ryan’s (1985) self-determination theory (SDT). According to SDT, human beings are intrinsically motivated when they have opportunities to satisfy their basic psychological needs, including competence, relatedness, and autonomy (Deci & Ryan, 1985; Deci & Ryan, 2000). Therefore, people are usually intrinsically motivated when they engage in the activities that truly interest them. Consequently, intrinsically motivated behaviors manifest a person’s self-determination and reveal the person’s true self (Deci, Vallerand, Pelletier, & Ryan, 1991). SDT further suggests that people have various goal contents and motives in their lives. Intrinsic goals are often supported by autonomous motives (Sheldon & Kasser, 1995), which may be promoted by autonomy-supportive social context (Vansteenkiste, Lens, & Deci, 2006). On the other hand, human beings may be extrinsically motivated when they engage in the activities that do not interest them (Deci & Ryan, 1985). Due to the natural tendency of self-regulation, people attempt to internalize external contingencies to be
self-regulated ones. Based on the stage of the internalizing process and the level of autonomy, externally motivated behaviors are categorized into external regulation, introjected regulation, identified regulation, and integrated regulation (Ryan, 1995). When a regulatory process is fully integrated, an individual can behave according to one’s other values and beliefs even though the behavior is initially extrinsically motivated. Thus, integrated regulation is considered to be as self-determined and autonomous as intrinsically motivated behaviors (Deci, Vallerand, Pelletier, & Ryan, 1991).

By applying SDT in examining teacher motivation, literature has demonstrated that teachers often have intrinsic goals with autonomous motives, leading them to enter the teaching profession (Eren & Tezel, 2010; Gutmann, 1987; Lortie, 1975; Roness, 2011). Thus, most teachers are motivated intrinsically or extrinsically motivated with integrated regulation. Both of these regulatory styles must be fostered by an autonomy-supportive context in order to promote teacher motivation. Consequently, many factors that satisfy teachers’ basic needs, including competence, relatedness, and autonomy, have been found to increase their motivation. Some of these factors that potentially increase teacher motivation are at the teachers’ personal level, such as the teachers’ self-efficacy (Fernet, Senécal, Guay, Marsh, & Dowson, 2008), perceived opportunities to collaborate with colleagues (Hildebrandt & Eom, 2011; Kocabaş, 2009; Skaalvik & Skaalvik, 2011), and perceived support from their schools (Smith & Ingersoll, 2004; Vandarakis, 2004). Other factors that potentially affect teacher motivation are at the school level, such as administrators’ leadership style (Cagle & Hopkins, 2009; Finnigan, 2010), teachers’ participation in decision making on school activities (Kocabaş, 2009; Smylie, Lazarus, & Brownlee-Conyers, 1996), and professional development opportunities offered to
teachers (Pop, Dixon, & Grove, 2010). Insofar as teacher motivation is a manifestation of their intrinsic goals and autonomous motives, literature has suggested that incentive pay, which aims to promote individuals’ extrinsic goals, cannot effectively increase teacher motivation (Frohreich, 1988; Ha & Sung, 2011; Murnane & Cohen, 1986; Ramirez, 2001; Sylvia & Hutchinson, 1985).

The present study sought to expand the existing literature and bring some clarity to the issue concerning teacher motivation. First, although many factors have been found to promote teacher motivation, they have not been systematically examined or supported by a motivation theory. For example, several studies have analyzed teacher survey data with descriptive statistics or exploratory factor analyses (EFA) in order to depict a picture of teacher motivation (Gokce, 2010; Hildebrandt & Eom, 2011; Kocabaş, 2009; Sylvia & Hutchinson, 1985). These studies have offered meaningful and practical insights regarding teachers’ perception of how they are motivated, but these studies are not connected to or examined by any particular motivation theory to support the fundamental assumption as to why teachers are motivated. Therefore, confirmatory factor analyses (CFA) were applied in this study to examine the validity of teacher motivation constructs and their measurements by SDT (Deci & Ryan, 1985). Second, despite several studies which have verified the constructs by CFA and revealed significant motivating factors (Eren & Tezel, 2010; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Skaalvik & Skaalvik, 2011), these studies have not analyzed concurrently the personal-level and school-level factors. On the one hand, researchers focusing on school-level factors often aggregated teachers’ individual responses into the school level and thus inevitably neglected the teacher-level variability. On the other hand, researchers focusing on
teacher-level factors were not able to take into consideration the variability in teacher motivation contributed by the influence of administrator leadership or school environment. For this reason, the present study analyzed both teacher-level and school-level factors concurrently by applying the multilevel modeling (MLM) approach. The MLM approach partitioned the within-school and between-school variability in teacher motivation to depict a more complete picture of teacher motivation. Third, even though teacher incentive pay has been argued or implied based on indirect evidence to be an ineffective factor to motivate teachers (Ramirez, 2001; Sylvia & Hutchinson, 1985), teacher-level monetary rewards have not been included or examined as an observed variable in these studies. The present study utilized the 2007-08 Schools and Staffing Survey, which recorded individual teachers’ base salary as well as monetary bonuses, and analyzed external rewards as personal-level observed variables along with the other potential predictors of teacher motivation. In doing so, the present study provided direct evidence on whether external rewards effectively impact teacher motivation, while taking into consideration all the other factors at the same time.

Based on the existing literature reviewed in this chapter, the multilevel structural equation modeling (ML-SEM) approach was adopted as the main methodology in this study to examine the effect of personal-level and school-level factors on teachers’ autonomous motivation. The details of the methodology are discussed in the next chapter.
This chapter first introduces the overarching research design of the present study. Thereafter, the sampling method, the data collection method, the sample size, and the reliability of the survey data used in this study, the 2007-08 Schools and Staffing Survey (SASS), is reported. In addition, the measurement and the variables from the survey data used in this study are reviewed. Finally, the procedure used to examine the theoretical constructs and the process of building the multilevel structural equation models (ML-SEM) are discussed.

Research Design

The researcher examined the motivating factors at the teachers’ personal and school level in the present study. Specifically, there were four research questions: (1) What is the effect of intrinsic motivators at the personal level, if any, on teacher motivation? (2) What is the effect of extrinsic motivators at the personal level, if any, on teacher motivation? (3) What is the effect of school-level factors, if any, on teacher motivation across schools? (4) How do school-level factors, if any, moderate the effect of motivators on teacher motivation at the personal level? On the basis of Deci and Ryan’s (1985) self-determination theory (SDT) and the existing literature reviewed in the preceding chapter, four hypotheses were proposed: (1) The motivating factors at the personal level that satisfy teachers’ basic needs—competence, relatedness, and
autonomy—such as teachers’ content competency, perceived collaboration, perceived school support, and classroom autonomy, have a positive effect on teacher motivation; (2) External rewards, such as base salary and bonus pay, have no significant effect on teachers’ autonomous motivation; (3) Teachers’ overall perceived collaboration and school support at the school level and teachers’ participation in decision making have a positive effect on overall teachers’ motivation at that school; (4) Principals’ leadership styles may moderate the effect of teachers’ personal-level motivators on their motivation.

The multilevel structural equation modeling (ML-SEM) was adopted as the main research design in order to accommodate two methodological issues raised by the research questions. First, in order to accommodate the hierarchical nature of teachers nested in schools and examine teacher motivation within the school context, the statistical method of multilevel modeling (MLM) was applied. Given that the teacher-level data were nested in the school-level data, the assumption of independence required by other traditional linear models was violated, which would result in biased estimates (Kenny & Judd, 1986). Traditionally, hierarchical data have often been analyzed with a disaggregation approach that focuses on the individual level or an aggregation approach that focuses on the group level (Byrne, 2012). However, the disaggregation approach neglects the violation of assumptions on independence, normality, and homoscedasticity and results in inflated Type I error rate (Heck & Thomas, 2009; Kreft & de Leeuw, 1998). The aggregation approach, on the other hand, reduces all variability of individuals into a single mean for a group and results in less efficient prediction equations and reduced statistical power (Raudenbush & Bryk, 2002). Thus, the strength of the MLM approach was beneficial to the present study, which accounted for the non-independence and
attempted to partition the observed variance in the nested (clustered) data into within- and between-cluster components (Bovaird, 2007; Mehta & Neale, 2005; Raudenbush & Bryk, 2002).

Second, the researcher attempted to verify the theoretical constructs of teacher motivation and several motivating factors in order to further examine the effect of these motivating factors on teacher motivation. Thus, the measurement of these abstract constructs (latent variables), such as teachers’ perception of various dimensions of motivation and their working environment, measured by the survey items (observed variables), was verified by the confirmatory factor analyses (CFA), which is a particular model from the structural equation modeling (SEM) approach. The SEM approach is capable of modeling means and covariances among multivariate data and further examining the interrelationships among the latent variables and other covariates (Mehta & Neale, 2005; Schumacker & Lomax, 2010).

To this end, the ML-SEM method is a combination of MLM and SEM, which borrows the strength of both MLM and SEM approaches and allows SEM models to be developed at each level of the nested data (Bauer, 2003; Mehta & Neale, 2005). The ML-SEM is a relatively new area of methodological research (Mehta & Neale, 2005), but not until recently has the computational process been advanced enough to separate the within-covariance matrix ($\Sigma_W$) and between-covariance matrix ($\Sigma_B$) of different sample sizes from a conventional SEM to provide appropriate estimators for the ML-SEM models (Byrne, 2012; Heck & Thomas, 2009). The ML-SEM models were conducted in the present study to accommodate the hierarchical nature of teachers’ perception data within the school context. The researcher followed a widely adopted four-step process for
informing the full ML-SEM models, which was initially outlined by Muthén (1994): (1) Conducting a conventional SEM ignoring the multilevel structure to try out model ideas; (2) Computing the estimated ICC for each observed variable to determine the degree of between-group variance; (3) Exploring the within-group structure; and (4) Exploring the between-group structure (Bovaird, 2007). Accordingly, the modeling process in this study (detailed in the Data Analysis section) started with several unilevel CFA models and then two-level CFA models to ensure that the theoretical constructs were measured appropriately at both the personal and school levels. Then an unconditional ML-SEM model was conducted to examine the effect of personal-level motivating factors. Finally, a contextual model was conducted, which was a two-level structural model that contained the explanatory variables at both the personal (level 1) and school level (level 2). The contextual model attempted to simultaneously verify the measurement of the theoretical constructs and examine the effect of motivating factors on teacher motivation at both the teachers’ personal and school level. The statistical package Mplus 6.12 was used to conduct the ML-SEM models in this study.

Survey Data

The 2007-08 Schools and Staffing Survey (SASS) was used in this study. This national database made it feasible for a large-scale quantitative study, aiming to generate meaningful, practical, and reliable results. There were two main reasons to use the 2007-08 SASS survey data in this study. First, SASS was a national database collected systematically and thoroughly (Tourkin, et al., 2010). It included both teacher-level and school-level data, so it is considered a dataset with full dimensions and levels of information. Second, the SASS surveys were designed to probe the most practical and
pressing issues concerning educators and policymakers (Tourkin, et al., 2010). Thus, the researcher utilized the survey items inquiring about teacher motivation, linked them to the constructs conceptualized in SDT (Deci & Ryan, 1985), and then examined the hypothesized factors and potential effects of motivators with the sample data. The following section discusses the details of the sampling design and data collection of SASS.

Schools and Staffing Survey

The Schools and Staffing Survey (SASS) is “conducted by the National Center for Education Statistics (NCES) on behalf of the U.S. Department of Education in order to collect extensive data on American public and private elementary and secondary schools” (Tourkin, et al., 2010, p. 1). The first attempt to create this kind of national database started in 1983, which included five surveys: the Survey of Teacher Demand and Shortage (conducted in 1983-84), the Public School Survey—School Questionnaire (1984-85), the National Survey of Private Schools—School Questionnaire (1985-86), the Public School Survey—Teacher Questionnaire (1984-85), and the National Survey of Private Schools—Teacher Questionnaire (1985-86). Since 1985, NCES started the process of redesigning the earlier elementary/secondary education surveys and expanded them into a set of concurrent and integrated surveys known as the Schools and Staffing Survey (SASS). The first administration of SASS was in the 1987-88 school year. The U.S. Census Bureau was assigned by NCES to be in charge of the data collection process in order to achieve high response rate and maintain consistency of the process across different SASS questionnaires. This version of SASS questionnaires was administered again in 1990-91 and 1993-94. Since 1993, NCES initiated another round of the
examination and redesigned the surveys in order to increase the quality and expand the scope of SASS. The 2007-08 SASS consisted of five questionnaires: the School District Questionnaire, Principal Questionnaire, School Questionnaire, Teacher Questionnaire, and School Library Media Center Questionnaire. The 2007-08 SASS questionnaires were given to public school districts, public (including public charter) schools, private schools, schools funded by the Bureau of Indian Education (BIE), principals, teachers, and public and BIE-funded school library media centers.

The survey data used in the present study, including the 2007-08 Teacher Questionnaire, the 2007-08 Principal Questionnaire, and the 2007-08 School Questionnaire, were three components of the 2007-08 Schools and Staffing Survey (SASS). The 2007-08 Teacher Questionnaire consisted of nine sections: General information, Class organization, Educational background, Certification and training, Professional development, Working conditions, School climate and teacher attitudes, General employment and background information, and Contact information. The 2007-08 Principal Questionnaire consisted of eight sections: Principal experience and training, Goals and decision making, Teacher and aide professional development, School climate and safety, Instructional time, Teacher and school performance, Working conditions and principal perceptions, and Demographic information. Based on the literature, 29 survey items from the Teacher Questionnaire and 22 survey items from the Principal Questionnaire were linked to their pertinent level-1 constructs (e.g., teacher motivation, perceived collaboration and school support) and level-2 constructs (e.g., teacher participation and principal control) respectively. Finally, two survey items from the 2007-08 School Questionnaire provided school information (i.e., school size and percentage of
minority population) and were merged with the teacher and principal data as level-2 covariates.

**Sampling Method**

The 2007-08 SASS was a “stratified probability proportionate to size (PPS) sample” (Tourkin, et al., 2010, p. 57). There were six major stratified levels for public (and BIE-funded) schools, including (A) BIE-funded schools, which were selected automatically in sample; (B) school with high American Indian or Alaska Native students; (C) schools in Delaware, Maryland, Florida, Nevada, and West Virginia; (D) public charter schools; (E) Career Technical Center (CTC) schools; (F) all other schools. All of the type A schools were included in the sample. Type B, C, D, and F schools were further stratified by state, but type C schools were also stratified by school district in order to include at least one school from each district in the sample. Type E schools were all placed into one stratum due to the small amount of CTC schools. In addition, group B through F (since BIE-funded schools were selected automatically in the sample) were further stratified by the grade span, including (a) Elementary: lowest grade <= 6 and highest grade <= 8; (b) Secondary: lowest grade <= 7 and highest grade <= 12; and (c) Combined: lowest grade <= 6 and highest grade > 8, or school is ungraded.

The construction of the SASS sampling frame relied heavily on the database called Common Core of Data (CCD). Tourkin et al. (2010) referred to CCD as “a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts and contains data that are designed to be comparable across all state” (p. A1), and CCD was “believed to be the most complete public school listing available” (p. 49). However, due to the SASS data collection
timeline, a preliminary CCD file from the preceding school year has usually been used as
the district and school list. The preliminary 2005-06 CCD file was used as the basis for
the 2007-08 SASS public school sampling frame. In order to avoid potential errors and
create a more precise list as the SASS schools, certain schools on the 2005-06 CCD were
deleted, collapsed, added, or corrected according to the 2007-08 SASS sampling rules.
For instance, a school was defined in SASS as “an institution or part of an institution that
provides classroom instruction to students; has one or more teachers to provide
instruction; serves students in one or more of grades 1-12 or the ungraded equivalent; and
is located in one or more buildings” (p. 49). Therefore, any school in the 2005-06 CCD
that did not meet these criteria was deleted from the sampling frame. The rules of frame
adjustment from CCD to SASS may vary from year to year in order to accommodate the
goal of SASS administration for that certain school year.

In order to increase the efficiency of school sample design and calculate school
district weights, the CCD data was sorted by nine different school-related variables,
including school stratum code (A-F, as reported in the preceding section), state, locale
code (12 combinations according to school typology and size), zip code, district ID,
school’s highest grade offered, percent minority enrollment (< 5.5% or unknown, >=
5.5%, >= 20.5%, and >= 50.5%), total enrollment, and school ID. In addition, within each
stratum, all non-BIE schools were sorted by size, measured by the square root of the
number of full-time equivalent teachers reported for each school imputed during
sampling frame creation. Any school with a measure of size greater than the sampling
interval was excluded from the probability sampling operation, meaning that “schools
with an unusually high number of teachers relative to other schools in the same stratum
were automatically included in the sample” (Tourkin, et al., 2010, p. 59). This produced a BIE-funded school sample of 178 schools, 453 high American Indian enrollment schools, 370 public charter schools, 20 CTC schools, and 8,952 other traditional public schools for a total of 9,973 sampled public and BIE-funded schools in the 2007-08 SASS.

With regard to the 2007-08 SASS teacher sampling frame, teachers were stratified into one of five teacher types: (a) New teachers expected to stay at their current school; (b) Mid-career and highly-experienced teachers expected to stay at their current school; (c) New teachers expected to leave their current school; (d) Mid-career teachers expected to leave their current school; or (e) Highly experienced teachers expected to leave their current school. There were two special components related to the teacher sampling design. First, teachers expected to leave (c-e) were intended to be oversampled. For new teachers in public schools, on the other hand, oversampling was not required “due to the large number of sampled schools with new teachers” (Tourkin, et al., 2010, p. 72). Second, in order not to overburden any sampled school, the maximum number of teachers sampled per school was set at 20. When the number of sampled teachers exceeded 20 in a school, the sample size “was reduced proportionally in all strata to achieve a final sample size of 20” (Tourkin, et al., 2010, p. 74). This teacher sampling process produced a total of 48,353 teachers in the 2007-08 SASS sample, consisting of 9,167 new stayers, 37,730 mid-career and highly experienced stayers, 387 new leavers, 369 mid-career leavers, and 700 highly-experienced leavers.

Data Collection

In 2005-06, a methodological field test was conducted on mail and telephone data collection. On the basis of the results, the 2007-08 SASS began with mailouts, followed
by telephone and personal visit follow-ups (Tourkin, et al., 2010). In addition, a school coordinator at each school was designated to facilitate the data collection during the mail and telephone processes. The data collection of 2007-08 SASS involved several steps in order to achieve a high response rate. In early summer, advance letters were mailed out to sampled schools to verify school addresses; then the school packages were mailed to the sampled schools at the beginning of the school year. This school package included a cover letter to the principal, a cover letter to the survey coordinator, a *Teacher Listing Form*, and the school-level questionnaires. Then a computer-assisted telephone interviewing (CATI) instrument called each school to verify school information, establish a survey coordinator (i.e., the main contact person at each school for subsequent communication), and follow up on the *Teacher Listing Form*. Then a second package of questionnaires was mailed to the survey coordinator at each school. Since teachers were sampled from the data provided on the *Teacher Listing Form*, the teacher-level questionnaires were mailed on a flow basis. Meanwhile, field follow-ups were conducted for schools that did not return the *Teacher Listing Form*. The survey coordinators were also called as a reminder to have staff complete and return all forms. When necessary, individual respondents (i.e., principal, librarian, and teacher) were also assisted over the phone to complete their questionnaires. Finally, field follow-ups were conducted for schools and corresponding teachers that did not return the questionnaires, and additional reminders were sent to teachers who did not respond (Tourkin, et al., 2010).

Centralized screening, survey coordinators, and nonresponse follow-ups were three essential characteristics of the 2007-08 SASS data collection process designed to achieve high response rate and reliability. In regards to centralized screening, the CATI
system replaced the field representatives utilized in the 2003-04 administration, who screened sampled schools by verifying their grade span, address, and typology. In the 2007-08 SASS, on the other hand, the verifying process was centralized as interviewers verified all important information with sampled schools via the CATI instrument. Tourkin et al. (2010) asserted that centralized screening “was beneficial in terms of cost; as well, supervisors could directly monitor progress and listen-in on interviews to ensure that procedures were being followed correctly” (p. 31). With regard to survey coordinators, they were established in approximately 73% of sampled schools, and they were responsible for distributing the questionnaires to appropriate staff, following up with the staff members, returning the completed questionnaires to the U.S. Census Bureaus, and responding to reminder calls to follow up with nonresponding participants (Tourkin, et al., 2010). The establishment of survey coordinators in 2007-08 SASS expedited the process of data collection and reduced burdens on the sampled schools. Finally, telephone and field nonresponse follow-ups took place for sampled schools and teachers that did not return the questionnaires. Different from previous SASS administrations, however, 2007-08 SASS conducted CATI reminder calls prior to the actual nonresponse follow-ups. During this operation, survey coordinators were contacted and reminded to help staff members complete and return the questionnaires, which “substantially decreased the number and length of phone calls; therefore, reducing burden on the schools and the cost of follow-up” (p. 32).

Sample Size

The 2007-08 SASS sample included 12,910 schools that had any of grades 1-12, the principals of the selected schools, and 56,358 of their teachers (Tourkin, et al., 2010).
This consisted of 5,251 school districts that operated the public schools. The 2007-08 Teacher Questionnaire was completed by 38,240 public school teachers across the country, and the 2007-08 Principal Questionnaire was completed by 7,459 public school principals across the country. The present study included the survey data from the 2007-08 Teacher Questionnaire at the within-school level (level 1) of the ML-SEM models. The principal and school-level data from the 2007-08 Principal Questionnaire were used at the between-school level (level 2).

Reliability

As the internal consistency reliability of survey items for each specific construct used in the present study, measured by Cronbach’s α, is discussed along with their validity reported by CFA, this section reports the description of overall reliability of the 2007-08 SASS. In the initial results of the 2007-08 SASS descriptive statistics reported by NCES (Coopersmith & Gruber, 2009), both of the sampling and non-sampling errors were discussed to ensure the reliability of the 2007-08 SASS sample data. While estimates of sampling errors could be derived, it was indicated that the 2007-08 SASS data have some potential non-sampling errors, which were attributed to various sources such as respondents’ definitional difficulties on survey items, different interpretation of questions, inability or unwillingness to recall or provide correct information, and errors made in the process of data collection or imputation for missing data. Nonetheless, Coopersmith and Gruber (2009) asserted that in order to ensure the reliability of SASS sample data, “quality control and edit procedures were used to reduce errors made by respondents, coders, and interviewers” (p. B12).
Measurement

Twenty-nine survey items from the 2007-08 Teacher Questionnaire were used as level-1 variables in this study. Based on the existing literature, these survey items were linked to their pertinent theoretical constructs to measure the latent variables or to calculate the mean scores for a particular level-1 variable. In addition, 22 survey items from the 2007-08 Principal Questionnaire were linked to their pertinent level-2 explanatory variables based on the existing literature. Finally, two items from the 2007-08 School Questionnaire were used as the level-2 covariates. The survey items used for each level-1 or level-2 variable are reported in the following section. Table 1 reports all of the level-1 and level-2 variables used in this study and the survey items used to measure them.

Teacher Motivation

The dependent variable teacher motivation (TCHER_MO) was theorized as a second-order latent variable and measured by three sub-constructs (first-order latent variables), including teachers’ resilience (RESILI), integrated regulation (INTEGR), and commitment to their schools or the teaching profession (COMMIT). Based on the existing literature (Deci & Ryan, 1985; Roness, 2011; Schondeld, 1990; Smylie, Lazarus, & Brownlee-Conyers, 1996), eight survey items from the 2007-08 Teacher Questionnaire that inquired about teachers’ attitudes were used as the observed variables and linked to their pertinent latent variables. The original survey items were measured by a four-level Likert scale (Strongly agree; Somewhat agree; Somewhat disagree; Strongly disagree). Several survey items were negatively stated so that they were recoded before the data analyses in order to measure the magnitude of teacher motivation consistently. Even
though these eight survey items appeared to be theoretically linked to the various aspects of teacher motivation, the validity of the measurement was examined. Specifically, a unilevel CFA and a multilevel measurement model were conducted to determine whether the sample data demonstrated that the construct of teacher motivation was appropriately measured by these survey items (reported in Chapter 4). The survey items used to measure each sub-construct (first-order latent variable) constituting the construct teacher motivation (second-order latent variable) are reported in this section.

The first sub-construct measuring teacher motivation was teachers’ resilience (RESILI). Teachers’ resilience at work is considered as a manifestation of their intrinsic motivation (Eyal & Roth, 2011; La Guardia, Ryan, Couchman, & Deci, 2000; Ryan, 1995; Sylvia & Hutchinson, 1985) and an opposite experience of emotional exhaustion or burnout (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Leithwood, Menzies, Jantzi, & Leithwood, 1999; Maslach & Jackson, 1984). Thus, three survey items that inquired about teachers’ perception of their enthusiasm, passion, and feelings of fatigue or burnout were linked to the sub-construct resilience and used as the observed variables of the latent variable RESILI. These three survey items (and the name of each observed variable) were [Q57a] “The stress and disappointments involved in teaching at this school aren’t really worth it” (worthiness); [Q57f] “I don’t seem to have as much enthusiasm now as I did when I began teaching” (enthusiasm); and [Q57g] “I think about staying home from school because I’m just too tired to go” (energy).

The second sub-construct measuring teacher motivation was teachers’ integrated regulation (INTEGR), which is considered a manifestation of how well teachers have
integrated the external contingencies with their values and beliefs (Deci, Vallerand, Pelletier, & Ryan, 1991; Kristof, 1996; Rosenberg, 1979). The existing literature has suggested that teachers exercise more autonomy and self-determination when they successfully integrate the values, beliefs, and goals of their schools (Skaalvik & Skaalvik, 2011; Smylie, Lazarus, & Brownlee-Conyers, 1996). The existing literature has further demonstrated that teachers’ integration between school visions and their personal values is closely related to their job satisfaction, which is considered an index of morale and motivation (Bishay, 1996; Schondeld, 1990). Thus, three survey items that inquired about teachers’ attitude toward their schools and their job satisfaction were linked to the sub-construct integrated regulation and used as the observed variables of the latent variable INTEGR. These three survey items (and the name of each observed variable) were [Q55q] “I am generally satisfied with being a teacher at this school” (satisfied_person); [Q57b] “The teachers at this school like being here; I would describe us as a satisfied group” (satisfied_group); and [Q57c] “I like the way things are run at this school” (like_things_run).

The third sub-construct measuring teacher motivation was teachers’ commitment to their schools or to the teaching profession (COMMIT). The existing literature has suggested that teacher retention is one of the manifestations of motivated teachers (Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Kaufman, 1984; Roness, 2011; Skaalvik & Skaalvik, 2011). Therefore, two survey items that inquired about teachers’ commitment in teaching and intention to stay at their current schools were linked to the sub-construct commitment and used as the observed variables of the latent variable COMMIT. These two survey items (and the name of each observed variable) were [Q57d] “If I could get a
higher paying job I’d leave teaching as soon as possible” (stay_teaching); and [Q57e] “I think about transferring to another school” (stay_school).

Personal-Level Factors

At the personal level, teachers’ content competency, perceived collaboration, perceived school support, and classroom autonomy potentially satisfy their basic psychological needs conceptualized in SDT (Deci & Ryan, 1985), including competence, relatedness, and autonomy. Therefore, they were hypothesized to be the level-1 factors that significantly increased teachers’ autonomous motivation (Hypothesis 1). Based on the existing literature, 16 survey items from the 2007-08 Teacher Questionnaire were linked to measure these motivating factors. On the other hand, external rewards were hypothesized to have an insignificant effect on teachers’ autonomous motivation, because they were not autonomy-supportive (Hypothesis 2). Teachers’ base salary and bonus pay were recorded in the 2007-08 Teacher Questionnaire, and they were used as the measurement of teachers’ external rewards. This section introduces the six level-1 explanatory variables, including teachers’ content competency measured by their Highly Qualified Teacher status (HQT), perceived collaboration (COLLABOR), perceived school support (SUPPORT), classroom autonomy (CLASS_AU), base salary (SALARY), and bonus pay (BONUS).

Content competency

Due to the intertwined relationships among teachers’ content competency, self-efficacy, and autonomous motivation (Cagle & Hopkins, 2009; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Ma, 1999; Tschannen-Moran, Hoy, & Hoy, 1998), teachers’ content competency was measured by their HQT status and included as a level-1
explanatory factor (HQT). Whether a respondent has HQT status was reported in the survey item [Q35a] “This school year, are you a Highly Qualified Teacher (HQT) according to your state’s requirements?” The item was designed as a dichotomous response (Yes/No). Although every state might have specific requirements or pathways for teachers to attain the HQT status, the general criteria of HQT were defined in the 2007-08 Teacher Questionnaire, stating “to be Highly Qualified, teachers must meet requirements related to 1) a bachelor’s degree, 2) full state certification, and 3) demonstrated competency in the subject area(s) taught.” Based on this definition of HQT, teachers from different states were comparable. Teachers’ HQT status was considered as a measure of their content competency and hypothesized to be an effective personal-level factor on teacher motivation.

**Perceived collaboration**

Based on the existing literature, teachers’ perceived collaboration with colleagues may satisfy their needs for competence and relatedness and further increase their autonomous motivation (Deci & Ryan, 1985; Kocabaş, 2009; Little, 1987; Hargreaves, 1992; Hildebrandt & Eom, 2011; Schondeld, 1990; Skaalvik & Skaalvik, 2011). Thus, teachers’ perceived collaboration among colleagues (COLLABOR) was hypothesized to promote teacher motivation. Measured by a four-level Likert scale (Strongly agree; Somewhat agree; Somewhat disagree; Strongly disagree), four items from the 2007-08 Teacher Questionnaire that inquired about teachers’ attitude toward the collaboration and shared values among their colleagues were linked to the construct perceived collaboration and used as the observed variables of the latent variable COLLABOR. These four survey items (and the name of each observed variable) were [Q55h] “Rules for student behavior
are consistently enforced by teachers in this school, even for students who are not in their classes” (consistent_rules); [Q55i] “Most of my colleagues share my beliefs and values about what the central mission of the school should be” (shared_values); [Q55j] “The principal knows what kind of school he or she wants and has communicated it to the staff” (princ_communicate); and [Q55k] “There is a great deal of cooperative effort among the staff members” (cooperative_effort).

Perceived school support

Based on the existing literature, teachers’ perceived school support may satisfy their needs for competence and relatedness so that it may increase teachers’ autonomous motivation (Deci & Ryan, 1985; Smith & Ingersoll, 2004; Vandarakis, 2004; Weiss, 1999). Therefore, teachers’ perceived school support (SUPPORT) was hypothesized to promote teacher motivation. Measured by a four-level Likert scale (Strongly agree; Somewhat agree; Somewhat disagree; Strongly disagree), five survey items from the 2007-08 Teacher Questionnaire that inquired about teachers’ attitude toward the support they receive from their schools were linked to the construct perceived school support and used as the observed variables of the latent variable SUPPORT. These five survey items (and the name of each observed variable) were [Q55a] “The school administration’s behavior toward the staff is supportive and encouraging” (admin_behavior); [Q55e] “Necessary materials such as textbooks, supplies, and copy machines are available as needed by the staff” (materials_available); [Q55g] “My principal enforces school rules for student conduct and backs me up when I need it” (rules_enforced); [Q55i] “In this school, staff members are recognized for a job well done” (work_recognized); and [Q55o] “I am given the support I need to teach students with special needs” (special_needs).
**Classroom autonomy**

Based on the existing literature, teachers’ classroom autonomy may satisfy their need for autonomy and further increase their autonomous motivation (Hargreaves, 2003; Hyslop-Margison & Sears, 2010). Thus, teachers’ classroom autonomy (CLASS AU) was hypothesized to promote teacher motivation. Six survey items from one survey question from the 2007-08 Teacher Questionnaire concerning teachers’ classroom autonomy were used to measure the level-1 explanatory variable CLASS AU. Given that teachers’ control over their classroom was a factual measure of magnitude rather than teachers’ perception, a mean score was created based on the six corresponding items. The survey question was [Q54] “How much actual control do you have IN YOUR CLASSROOM at this school over the following areas of your planning and teaching?” Six corresponding items were measured by a four-level Likert scale (No control; Minor control; Moderate control; A great deal of control), including [Q54a] “Selecting textbooks and other instructional materials;” [Q54b] “Selecting content, topics, and skills to be taught;” [Q54c] “Selecting teaching techniques;” [Q54d] “Evaluating and grading students;” [Q54e] “Disciplining students;” and [Q55f] “Determining the amount of homework to be assigned.”

**Base salary and bonus**

Teachers’ external rewards were hypothesized to be ineffective factors on their autonomous motivation, because they are not autonomy-supportive (Ha & Sung, 2011; Pink, 2009; Ramirez, 2001; Sylvia & Hutchinson, 1985). One survey item in the 2007-08 Teacher Questionnaire inquired about individual teachers’ incentive pay, stating [Q64] “DURING THE CURRENT SCHOOL YEAR, have you earned income from any OTHER sources from this school system, such as a merit pay bonus, state supplement,
etc.?" The actual amounts of the bonus were recorded in whole dollars, so that it was analyzed as a continuous variable (BONUS). In addition, amounts of individual teachers’ base salary were also recorded in whole dollars by the survey item [Q62] “DURING THE CURRENT SCHOOL YEAR, what is your academic year base teaching salary?” Teachers’ base salary (SALARY) was treated as a continuous variable to examine the effect of external rewards on their motivation.

School-Level Factors

The school-level factors were included as the level-2 explanatory variables in the present study. The researcher aimed to examine the extent to which these school-level factors affect the variability in average teachers’ motivation across schools (Hypothesis 3) as well as how they may moderate the effect of the level-1 explanatory variables on teacher motivation (Hypothesis 4). Based on the existing literature, 22 survey items from the 2007-08 Principal Questionnaire were used to measure the school-level motivating factors. In addition, in order to examine the effect of principals’ leadership on the average attitude of the teaching staff at a certain school, teachers’ perceived collaboration and school support were also measured at the school level. The summary measures of overall teachers’ perceived collaboration and school support at the school level were included as level-2 explanatory variables that may contribute to the between-school variability in teacher motivation. This section introduces these five level-2 explanatory variables, including teachers’ participation in decision making (TCHER_PA), principals’ control over school activities (PRINC_CO), opportunities of professional development provided for teachers (TCHER_PD), overall teachers’ perceived collaboration at the school level
(COLLAB_b), and overall teachers’ perceived school support at the school level (SUPPOR_b).

Teacher participation in decision making

Based on the existing literature, teachers’ participation in decision making on school activities may increase their autonomous motivation (Jongmans, Sleegers, Biemans, & de Jong, 2004; Kocabaș, 2009; Smylie, Lazarus, & Brownlee-Conyers, 1996). Therefore, teachers’ participation in decision making (TCHER_PA) was included as a level-2 explanatory variable and measured by seven survey items from the 2007-08 Principal Questionnaire as the principals were asked about how much overall teacher participation in decision making takes place in their schools. The survey question regarding teacher control was [Q12.5] “How much ACTUAL influence do you think [teachers have] on decisions concerning the following activities?” These school activities included [Q12a] “Setting performance standards for students of this school;” [Q12b] “Establishing curriculum at this school;” [Q12c] “Determining the content of in-service professional development programs for teachers of this school;” [Q12d] “Evaluating teachers of this school;” [Q12e] “Hiring new full-time teachers of this school;” [Q12f] “Setting discipline policy at this school;” and [Q12g] “Deciding how your school budget will be spent.” The items were measured by a four-level Likert scale (No influence; Minor influence; Moderate influence; Major influence), and a mean score of these items was calculated to measure teachers’ participation in decision making as a level-2 predictor (TCHER_PA).
Principal control

Based on the existing literature, principals’ managerial control was hypothesized to have a significant effect on teacher motivation (Eyal & Roth, 2011; Fernet, Senécal, Guay, Marsh, & Dowson, 2008; Leithwood, Tomlinson, & Genge, 1996). Therefore, several survey items from the 2007-08 Principal Questionnaire were used to measure principals’ managerial control (PRINC_CO). Specifically, principals were asked to rate their own control over school activities following the same question used to rate teachers’ control in seven different areas reported in the preceding section. The survey question regarding principal control was [Q12.4] “How much ACTUAL influence do you think [the principal] has on decisions concerning the following activities?” The items were also measured by a four-level Likert scale (No influence; Minor influence; Moderate influence; Major influence), and the average score was used as the measure of the level-2 explanatory variable PRINC_CO.

Professional development

Although the effect of professional development on teacher motivation has not been extensively examined, the existing literature has suggested that the opportunity of professional development provided for teachers may enhance their teaching quality and motivation (Kardash, 2000; Pop, Dixon, & Grove, 2010; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). Thus, the opportunity of professional development for teachers (TCHER_PD) was included as a level-2 explanatory variable. In the 2007-08 Principal Questionnaire, principals were asked about the teachers’ opportunities to participate in professional development at their schools using the question [Q15] “How often is professional development for teachers at this school?” Undeniably, this was a
measure of principals’ perception of the implementation of professional development at their schools rather than a more objective instrument. Nonetheless, it was measured by a five-level Likert scale (Never; Rarely; Sometimes; Frequently; Always), and the average score was used as the level-2 explanatory variable \textit{TCHER\_PD}. The areas of professional development included [Q15a] “Designed or chosen to support the school’s improvement goals;” [Q15b] “Designed or chosen to support the district’s improvement goals;” [Q15c] “Designed or chosen to support the implementation of state or local standards;” [Q15d] “Evaluated for evidence of improvement in student achievement;” [Q15e] “Considered part of teachers’ regular work;” [Q15f] “Planned by teachers in this school or district;” [Q15g] “Presented by teachers in this school or district;” [Q15h] “Accompanied by the resources that teachers need (e.g., time and materials) to make changes in the classroom.”

\textit{Perceived collaboration and school support at the school level}

The researcher aimed to examine principals’ leadership on teacher motivation. Thus, in addition to principals’ managerial control over school activities (\textit{PRINC\_CO}), measured in the 2007-08 Principal Questionnaire, the effect of principal leadership was also measured by the average teachers’ perception of collaboration and school support at the school level. Based on the existing literature, principals with different leadership styles may result in various school cultures and consequently different levels of teachers’ collaboration and trust (Eyal & Roth, 2011; Geijsel, Sleegers, Leithwood, & Jantzi, 2003; Hallinger & Heck, 1998; Leithwood, Menzies, Jantzi, & Leithwood, 1999; Ramachandran & Krishnan, 2009). For instance, a principal as a transformational leader creates a school culture that reinforces collaboration and provides support to teachers as they share responsibilities and make decisions (Green, 2010). For this reason, the present
study focused on average teachers’ perception of collaboration and school support at the school level in order to examine whether the difference on average teachers’ perception of collaboration and school support among the sampled schools, presumably caused by principals’ leadership style, contributed to the between-school variability in teacher motivation.

Therefore, the present study adopted a common practice in the MLM context to include aggregated information from level-1 variables to create certain level-2 variables, so that the compositional effect of variables may also be analyzed to determine if they contributed to the difference across groups (Kreft & de Leeuw, 1998; Raudenbush & Bryk, 2002). Kreft and de Leeuw (1998) suggested that the group mean of an individual-level variable can be used as a contextual variable to help explain the effect of group membership on individual behavior. Specifically, two level-1 latent variables were aggregated to the school level and included as level-2 latent variables to help explain the between-school variance in teacher motivation. Teachers’ perceived collaboration (COLLABOR) was measured at the school level as COLLAB_b, and teachers’ perceived school support (SUPPORT) was measured at the school level as SUPPOR_b. At the individual level, these variables provided individual teachers’ perception of collaboration and school support, and their summary measure at the second level provided the average attitude across the sampled teachers at a particular school toward collaboration and school support.

Covariates

Five covariates were included in the ML-SEM models in the present study. At the teachers’ personal level, literature has suggested that teachers’ experience, advanced
education, race, and their schools’ performance level may be associated with their expectancy (Finnigan, 2010). In addition, teachers’ teaching experience has been found to be a moderating factor that drives teachers of different ages to have different motivators in their profession (Hildebrandt & Eom, 2011). For this reason, teachers’ years of experience (YR_EXP), credentials (MASTER), and gender (GENDER) were included as level-1 covariates. At the school level, school size (SIZE) and students’ social-economic backgrounds (MINORITY) were included as level-2 covariates.

Teacher characteristics

Teachers’ characteristics as level-1 covariates were obtained from their responses in the 2007-08 Teacher Questionnaire. Specifically, teaching experience (YR_EXP) was reported in survey item [Q10a] “How many years have you worked as a FULL-TIME elementary or secondary teacher in PUBLIC SCHOOLS?” This item was recorded as whole years and used as a continuous variable. Whether a teacher had a master’s degree (MASTER) was reported in [Q25a] “Do you have a master’s degree?” and measured as a dichotomous variable (Yes/No). Teachers’ gender (GENDER) was recorded in [Q67] “Are you male or female?” as a dichotomous variable as well (Male/Female).

School characteristics

School size (SIZE) and percentage of minority population (MINORITY) were included as level-2 explanatory variables to help explain the variability in teacher motivation across schools. These two variables were merged from the 2007-08 School Questionnaire. Specifically, school size was reported in the survey item [Q2] “Around the first of October, how many students in grades K-12 and comparable ungraded levels were enrolled in this school?” This item excluded any prekindergarten, postsecondary, or
adult education students, and it was recorded as the number of students. With regard to the percentage of minority population as a level-2 covariate, it was calculated based on two survey items [Q5] “Around the first of October, how many students enrolled in grades K-12 and comparable ungraded levels were” [Q5b] “White, not of Hispanic or Latino origin” and [Q5f] “Total students.” The percentage of minority students was calculated and used as a continuous variable at the second level.
<table>
<thead>
<tr>
<th>Construct</th>
<th>Survey</th>
<th>Variable Name</th>
<th>Item</th>
<th>Statement</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DV</strong></td>
<td>Teacher</td>
<td>TCHER_MO RESILI worthiness</td>
<td>57a</td>
<td>The stress and disappointments involved in teaching at this school aren’t really worth it.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>enthusiasm</td>
<td>57f</td>
<td>I don’t seem to have as much enthusiasm now as I did when I began teaching.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>energy</td>
<td>57g</td>
<td>I think about staying home from school because I’m just too tired to go.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Resilience</td>
<td>Teacher</td>
<td>INTEGR satisfied_person</td>
<td>55q</td>
<td>I am generally satisfied with being a teacher at this school.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Integrated Regulation</td>
<td>Teacher</td>
<td>satisfied_group</td>
<td>57b</td>
<td>The teachers at this school like being here; I would describe us as a satisfied group.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>like_things_run COMMIT</td>
<td>57c</td>
<td>I like the way things are run at this school.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Commitment</td>
<td>Teacher</td>
<td>stay_teaching</td>
<td>57d</td>
<td>If I could get a higher paying job I’d leave teaching as soon as possible.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>stay_school</td>
<td>57e</td>
<td>I think about transferring to another school.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td><strong>Level-I IVs</strong></td>
<td>Teacher</td>
<td>HQT</td>
<td>35a</td>
<td>This school year, are you a Highly Qualified Teacher (HQT) according to your state’s requirements?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Content Competency (HQT)</td>
<td>Teacher</td>
<td>COLLABOR consistent_rules</td>
<td>55h</td>
<td>Rules for student behavior are consistently enforced by teachers in this school, even for students who are not in their classes.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>shared_values</td>
<td>55i</td>
<td>Most of my colleagues share my beliefs and values about what the central mission of the school should be.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>princ_communicate</td>
<td>55j</td>
<td>The principal knows what kind of school he or she wants and has communicated it to the staff.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Perceived Collaboration</td>
<td>Teacher</td>
<td>cooperative_effort</td>
<td>55k</td>
<td>There is a great deal of cooperative effort among the staff members.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>admin_behavior</td>
<td>55a</td>
<td>The school administration’s behavior toward the staff is supportive and encouraging.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>materials_available</td>
<td>55e</td>
<td>Necessary materials such as textbooks, supplies, and copy machines are available as needed by the staff.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>rules_enforced</td>
<td>55g</td>
<td>My principal enforces school rules for student conduct and backs me up when I need it.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>work_recognized</td>
<td>55l</td>
<td>In this school, staff members are recognized for a job well done.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>special_needs</td>
<td>55o</td>
<td>I am given the support I need to teach students with special needs.</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Perceived School Support</td>
<td>Teacher</td>
<td>CLASS_AU</td>
<td>54a</td>
<td>How much actual control do you have IN YOUR CLASSROOM at this school over the following areas of your planning and teaching?</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54b</td>
<td>Selecting textbooks and other instructional materials</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54c</td>
<td>Selecting content, topics, and skills to be taught</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54d</td>
<td>Selecting teaching techniques</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54e</td>
<td>Evaluating and grading students</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54f</td>
<td>Disciplining students</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Classroom Autonomy</td>
<td>Teacher</td>
<td>SALARY</td>
<td>62</td>
<td>During the current school year, what is your academic year base teaching salary?</td>
<td>Continuous</td>
</tr>
<tr>
<td>Base Salary</td>
<td>Teacher</td>
<td>CONUS</td>
<td>64</td>
<td>During the current school year, have you earned income from an OTHER sources from this school system, such as a merit pay bonus, state supplement, etc.? How much?</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

Table 1. Variables and Survey Items
Table 1 continued

<table>
<thead>
<tr>
<th>Construct</th>
<th>Survey</th>
<th>Variable Name</th>
<th>Item</th>
<th>Statement</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level-1 Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of Experience</td>
<td>Teacher</td>
<td>$YR_{\text{EXP}}$</td>
<td>10a</td>
<td>How many years have you worked as a FULL-TIME elementary or secondary teacher in PUBLIC SCHOOLS?</td>
<td>Continuous</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>Teacher</td>
<td>$\text{MASTER}$</td>
<td>25</td>
<td>Do you have a master’s degree?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Gender</td>
<td>Teacher</td>
<td>$GENDER$</td>
<td>67</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level-2 IVs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Participation</td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12a</td>
<td>How much ACTUAL influence do you think [teachers] has on decisions concerning the following activities?</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12b</td>
<td>Setting performance standards for students of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12c</td>
<td>Establishing curriculum at this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12d</td>
<td>Determining the content of in-service professional development programs for teachers of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12e</td>
<td>Evaluating teachers of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12f</td>
<td>Hiring new full-time teachers of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12f</td>
<td>Setting discipline policy at this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PA}}$</td>
<td>12g</td>
<td>Deciding how your school budget will be spent</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Principal Control</td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12g</td>
<td>How much ACTUAL influence do you think [principal] has on decisions concerning the following activities?</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12a</td>
<td>Setting performance standards for students of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12b</td>
<td>Establishing curriculum at this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12c</td>
<td>Determining the content of in-service professional development programs for teachers of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12d</td>
<td>Evaluating teachers of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12e</td>
<td>Hiring new full-time teachers of this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12f</td>
<td>Setting discipline policy at this school</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$PRINC_{\text{CO}}$</td>
<td>12g</td>
<td>Deciding how your school budget will be spent</td>
<td>Likert (4)</td>
</tr>
<tr>
<td>Professional Development</td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15g</td>
<td>How often is professional development for teachers at this school?</td>
<td>Likert (4)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15a</td>
<td>Designed or chosen to support the school’s improvement goals</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15b</td>
<td>Designed or chosen to support the district’s improvement goals</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15c</td>
<td>Designed or chosen to support the implementation of state or local standards</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15d</td>
<td>Evaluated for evidence of improvement in student achievement</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15e</td>
<td>Considered part of teachers’ regular work</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15f</td>
<td>Planned by teachers in this school or district</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15g</td>
<td>Presented by teachers in this school or district</td>
<td>Likert (5)</td>
</tr>
<tr>
<td></td>
<td>Principal</td>
<td>$TCHER_{\text{PD}}$</td>
<td>15h</td>
<td>Accompanied by the resources that teachers need (e.g., time and materials) to make changes in the classroom (Same as the survey items from the personal level)</td>
<td>Likert (5)</td>
</tr>
<tr>
<td>Teachers’ Perceived Collaboration at the School Level</td>
<td></td>
<td>$COLLAB_{\text{b}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers’ Perceived School Support at the School Level</td>
<td></td>
<td>$SUPPOR_{\text{b}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level-2 Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Size</td>
<td>School</td>
<td>$SIZE$</td>
<td>2</td>
<td>Around the first of October, how many students in grades K-12 and comparable ungraded levels were enrolled in this school?</td>
<td>Continuous</td>
</tr>
<tr>
<td>Minority</td>
<td>School</td>
<td>$MINORITY$</td>
<td>5b, 5f</td>
<td>Around the first of October, how many students enrolled in grades K-12 and comparable ungraded levels were—[b] White, not of Hispanic or Latino origin? [f] Total students</td>
<td>Continuous</td>
</tr>
</tbody>
</table>
Data Analyses

The multilevel structural equation modeling (ML-SEM) was adopted as the main statistical method in the present study. Even though the goal was to build a ML-SEM to examine potential factors affecting teacher motivation at both the personal and school level, two preliminary tasks were done before building the ML-SEM model. First, due to the hierarchical nature of the teacher data nested in schools, the total variability in teacher motivation was partitioned into within- and between-school level in order to gauge the proportion of variance actually contributed by schools. The partition of variability also verified whether the hierarchal approach and multilevel modeling (MLM) was necessary and beneficial to answer the research questions. Second, as teacher motivation and two explanatory variables, teachers’ perceived collaboration (COLLABOR) and school support (SUPPORT), were all theoretically constructed based on SDT (Deci & Ryan, 1985), the quality of these constructs being measured by the sample data was verified. As the measurement model of constructs was confirmed, the structural models built upon these latent variables along with other variables that were directly observed in the survey data. This section first introduces the steps of these preliminary tasks and then the ML-SEM models. Finally, some analytical strategies specifically used to accommodate the 2007-08 SASS survey data are introduced.

Partition of Variability

The researcher attempted to utilize the strength of the MLM approach that partitions the total variance in the dependent variable into within- and between-group components so that a separate SEM model can be specified at each level (Byrne, 2012). In a ML-SEM model, the total covariance matrix (\( \Sigma \)) is partitioned into a within-
covariance matrix ($\Sigma_W$) and a between-covariance matrix ($\Sigma_B$). In the present study, the $\Sigma_W$ matrix represented the variability in teacher motivation at the personal level and their correlates while controlling for the variation across schools, whereas the $\Sigma_B$ matrix represented the variability in teacher motivation at the school level. In the MLM context, the proportion of the variance contributed by groups (schools) is often calculated in an empty model, also known as a null model, which does not contain any explanatory variables at either within-group level (level 1) or between-group level (level 2) of the model. Therefore, an empty model is essentially a one-way ANOVA model with random effects and is often used as a baseline model to estimate the proportion of within- and between-group variability in the dependent variable (Raudenbush & Bryk, 2002). The first level of a generic empty model can be written as

$$Y_{ij} = \beta_{0j} + r_{ij}$$ \[1.1\]

and at the second level,

$$\beta_{0j} = \gamma_{00} + u_{0j}$$ \[1.2\]

where $Y_{ij}$ = dependent variable (teacher motivation) for $i^{th}$ teacher in the $j^{th}$ school
$\beta_{0j}$ = level-1 random coefficients
$r_{ij}$ = level-1 random effects; $\text{var}(r_{ij}) = \sigma^2$
$\gamma_{00}$ = level-2 fixed effect
$u_{0j}$ = level-2 random effects; $\text{var}(u_{0j}) = \tau_{00}$

The intra-class correlation (ICC) coefficient can be calculated in the empty model. By definition, ICC is the proportion of variability in the outcome variable that can be accounted for by the groups, which can be considered as a measure of the degree of dependence of individuals (Kenny & Judd, 1986). Kreft and de Leeuw (1998) defined ICC as “the proportion of the variance in the outcome variable that is between the second-level units” (p. 9). In this study, ICC represented the proportion of variance in
teacher motivation between schools. The existence of ICC provides evidence of the inadequacy of traditional linear models and the necessity of multilevel modeling as statistical method to analyze the data. The formula for ICC is

\[
ICC = \frac{\tau_{00}}{\tau_{00} + \sigma^2}
\]

where \( \tau_{00} \) is the variance of \( r_{ij} \) at the first level, and \( \sigma^2 \) is the variance of \( u_{0j} \) at the second level. ICC partitions out the between-group variation from the total variance and indicates the percentage of the between-group variation out of the total variation. Thus, ICC is a fairly important index in multilevel analyses, because it helps determine the necessity and usefulness of multilevel models used to analyze any given sample data (Kenny & Judd, 1986; Kreft & de Leeuw, 1998; Raudenbush & Bryk, 2002). To this end, a non-zero ICC supports the necessity of analyzing sample data with MLM models (Julian, 2001; Selig, Card, & Little, 2008).

Measurement Model

In order to determine if the theoretically constructed variables were appropriately measured by the survey items, the researcher utilized the strength of the SEM approach. Specifically, confirmatory factor analyses (CFA) were conducted for the constructs of teachers’ perception to ensure the validity of these latent variables. Since teacher motivation was theorized as a construct that consisted of three sub-constructs, including resilience, integrated regulation, and commitment, it was measured as a second-order latent variable (\( TCHER\_MO \)) measured by three first-order latent variables (\( RESILI, INTEGR, COMMIT \)). In addition to the dependent latent variables, teachers’ perceived collaboration (\( COLLABOR \)) and school support (\( SUPPORT \)) were modeled as independent latent variables and verified in the CFA models. In contrast to an exploratory
factor analysis (EFA), in which a set of observed variables are related to a factor if they share common variance-covariance characteristics, a CFA “statistically tests the significance of a hypothesized factor model—that is, whether the sample data confirm that model” (Schumacker & Lomax, 2010, p. 164). Similar to how parameters are estimated in other SEM models, in a CFA model, the sample covariance matrix $S$ is compared to the theoretical model implied covariance matrix $\Sigma$ to find a unique set of parameter estimates. When the model fits the sample data well, the sample covariance matrix $S$ is close to $\Sigma$ (Schumacker & Lomax, 2010). In the ML-SEM context, $\Sigma$ is partitioned into a within-covariance matrix ($\Sigma_w$) and a between-covariance matrix ($\Sigma_b$). For illustrative purposes, a unilevel CFA model that contains two latent variables and six observed variables (survey items responded by teachers) can be written as

$$
\begin{bmatrix}
y_{1i} \\
y_{2i} \\
y_{3i} \\
y_{4i} \\
y_{5i} \\
y_{6i}
\end{bmatrix}
= 
\begin{bmatrix}
v_1 \\
v_2 \\
v_3 \\
v_4 \\
v_5 \\
v_6
\end{bmatrix}
+ 
\begin{bmatrix}
\lambda_{11} & 0 \\
\lambda_{21} & 0 \\
\lambda_{31} & 0 \\
0 & \lambda_{42} \\
0 & \lambda_{52} \\
0 & \lambda_{62}
\end{bmatrix}
\begin{bmatrix}
\eta_{1i} \\
\eta_{2i}
\end{bmatrix}
+ 
\begin{bmatrix}
e_{1i} \\
e_{2i} \\
e_{3i} \\
e_{4i} \\
e_{5i} \\
e_{6i}
\end{bmatrix}
$$

where $y_{1i}, y_{2i}, \ldots, y_{6i}$ = observed responses of teacher $i$ to the survey items 1-6
$v_1, v_2, \ldots, v_6$ = measurement intercepts of the survey items 1-6
$\lambda_{11}, \lambda_{21}, \lambda_{31}$ = factor loadings of the survey items 1-3 on the first latent variable
$\lambda_{42}, \lambda_{52}, \lambda_{62}$ = factor loadings of the survey items 4-6 on the second latent variable
$\eta_{1i}, \eta_{2i}$ = unobserved true scores of the latent variables 1-2
$e_{1i}, e_{2i}, \ldots, e_{6i}$ = residuals for teacher $i$

The model implies that the survey items 1, 2, and 3 are theorized as observed variables used to measure the first latent variable; and survey items 4, 5, and 6 are theorized as observed variables used to measure the second variable. If the theorized model fits the sample data, a unique set of parameter estimates for $\nu$’s and $\lambda$’s can be found to make $S$
and $\Sigma$ close to each other. In reality, some parameters may need to be fixed in order to make the model identified (Schumacker & Lomax, 2010). In the ML-SEM context, the individual (teacher) data are nested in the groups (schools). Thus, individual teachers’ responses ($y$’s) are further conceptualized in two levels by partitioning the responses into between-group ($y_b$’s) and within-group ($y_w$’s) deviations from the measurement intercepts (Bauer, 2003; Mehta & Neale, 2005). The partition of the observed responses can be rewritten as

$$
\begin{bmatrix}
y_{1ij} \\
y_{2ij} \\
y_{3ij} \\
y_{4ij} \\
y_{5ij} \\
y_{6ij}
\end{bmatrix} = \begin{bmatrix}
\beta_1 \\
\beta_2 \\
\beta_3 \\
\beta_4 \\
\beta_5 \\
\beta_6
\end{bmatrix} + \begin{bmatrix}
y_{1ij}^b \\
y_{2ij}^b \\
y_{3ij}^b \\
y_{4ij}^b \\
y_{5ij}^b \\
y_{6ij}^b
\end{bmatrix} + \begin{bmatrix}
y_{1ij}^w \\
y_{2ij}^w \\
y_{3ij}^w \\
y_{4ij}^w \\
y_{5ij}^w \\
y_{6ij}^w
\end{bmatrix}
$$

[3.2]

where $y_{ij}$’s = observed responses of individual $i$ nested within school $j$ to the survey items 1-6

$\beta$’s = measurement intercepts

$y_b$’s = between-group deviations of school $j$ from the intercepts

$y_w$’s = within-group deviations of teacher $i$ in school $j$ from the intercepts

The between-group and within-group deviations can be estimated separately at the between and within level in the two-level SEM model, written as

$$
\begin{bmatrix}
y_{1ij}^b \\
y_{2ij}^b \\
y_{3ij}^b \\
y_{4ij}^b \\
y_{5ij}^b \\
y_{6ij}^b
\end{bmatrix} = \begin{bmatrix}
\lambda_{11}^b \\
\lambda_{21}^b \\
\lambda_{31}^b \\
\lambda_{41}^b \\
\lambda_{51}^b \\
\lambda_{61}^b
\end{bmatrix} \begin{bmatrix}
\eta_{1ij}^b \\
\eta_{2ij}^b \\
\eta_{3ij}^b \\
\eta_{4ij}^b \\
\eta_{5ij}^b \\
\eta_{6ij}^b
\end{bmatrix} \quad \text{and} \quad
\begin{bmatrix}
y_{1ij}^w \\
y_{2ij}^w \\
y_{3ij}^w \\
y_{4ij}^w \\
y_{5ij}^w \\
y_{6ij}^w
\end{bmatrix} = \begin{bmatrix}
\lambda_{11}^w \\
\lambda_{21}^w \\
\lambda_{31}^w \\
\lambda_{41}^w \\
\lambda_{51}^w \\
\lambda_{61}^w
\end{bmatrix} \begin{bmatrix}
\eta_{1ij}^w \\
\eta_{2ij}^w \\
\eta_{3ij}^w \\
\eta_{4ij}^w \\
\eta_{5ij}^w \\
\eta_{6ij}^w
\end{bmatrix} + \begin{bmatrix}
e_{1ij} \\
e_{2ij} \\
e_{3ij} \\
e_{4ij} \\
e_{5ij} \\
e_{6ij}
\end{bmatrix}
$$

[3.3]

Where $\lambda_{ij}^b$’s, $\lambda_{ij}^w$’s = the factor loadings at the between and within level

$\eta_{ij}^b$’s, $\eta_{ij}^w$’s = the unobserved true factor scores at the between and within level
\[ \zeta^b_i, \zeta^w_i = \text{residuals for school } j \text{ at the between level} \]
\[ e^w_i = \text{residuals for teacher } i \text{ in school } j \text{ at the within level} \]

In this study, the researcher attempted to compare teacher motivation across the sampled schools and further examine the school-level motivating factors that explained the between-school variability in teacher motivation. Therefore, the between-level and within-level factor loadings for the constructs (latent variables) were constrained to be equal across levels so that the constructs were comparable across schools (Byrne, 2012; Mehta & Neale, 2005; Muthén, 1991; Muthén & Muthén, 1998-2010). Mehta and Neale (2005) suggested that the invariant factor loadings across within and between levels (\( \eta^b = \eta^w = \eta \)) implies that the within factors have random intercepts varying across schools. Consequently, the scales of the latent common variables across levels are equated, and the latent variables variances can be directly compared. To this end, the illustrative two-level CFA model can be rewritten as

\[
\begin{bmatrix}
    y_{1ij} \\
    y_{2ij} \\
    y_{3ij} \\
    y_{4ij} \\
    y_{5ij} \\
    y_{6ij}
\end{bmatrix} =
\begin{bmatrix}
    \beta_1 \\
    \beta_2 \\
    \beta_3 \\
    \beta_4 \\
    \beta_5 \\
    \beta_6
\end{bmatrix}
\begin{bmatrix}
    \lambda_{11} \\
    \lambda_{21} \\
    \lambda_{31} \\
    0 \\
    0 \\
    0
\end{bmatrix}
\begin{bmatrix}
    \eta_{1ij} \\
    \eta_{2ij} \\
    \eta_{3ij} \\
    \eta_{4ij} \\
    \eta_{5ij} \\
    \eta_{6ij}
\end{bmatrix} +
\begin{bmatrix}
    \zeta^b_{1j} \\
    \zeta^b_{2j} \\
    \zeta^b_{3j} \\
    \zeta^b_{4j} \\
    \zeta^b_{5j} \\
    \zeta^b_{6j}
\end{bmatrix} +
\begin{bmatrix}
    e^w_{1ij} \\
    e^w_{2ij} \\
    e^w_{3ij} \\
    e^w_{4ij} \\
    e^w_{5ij} \\
    e^w_{6ij}
\end{bmatrix} \quad [3.4]
\]

As the latent variables \( \eta_{1ij} \) and \( \eta_{2ij} \) are composed of between-group deviations (\( \eta^b \)’s) and within-group deviations (\( \eta^w \)’s), they can be considered as individual-latent variables with random intercepts at the between-group level (Mehta & Neale, 2005). The model also implies that the raw item responses have schools’ variability (\( \zeta^b \)’s) at the between level and teachers’ variability (\( e^w \)’s) at the within level. The residual variances for the observed variables at the between level (\( \zeta^b \)’s) are practically estimated at zero in a multilevel CFA.
model with random intercepts of the latent variables (Bauer, 2003). Mehta and Neale (2005) concluded that “invariance of across-level factor loadings in the general-specific model and zero variability for the observed indicators at the second level are necessary prerequisites for the use of the parsimonious hierarchical factor model” (p. 274).

The measurement model served as an important preliminary step in the present study before evaluating the structural models (Byrne, 2012). The validity of the theoretical constructs was examined by the model fit indices in the measurement models, including Root-Mean-Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI). The results of the measurement models also provided recommendations for model modification. During the modeling process, the researcher followed the conventional SEM modeling techniques and used the modification indices (MIs) to retheorize the proposed models or modify the proposed measurement of the theoretical constructs when the recommended modifications were theoretically justifiable (Byrne, 2012; Schumacker & Lomax, 2010). The researcher first conducted a unilevel CFA model to verify the dependent latent variables including TCHER_MO, RESILI, INTEGR, and COMMIT in order to obtain an overall picture of teacher motivation. As the construct of teacher motivation was modified based on the model results, a two-level measurement model was conducted to further confirm the construct of teacher motivation at both the within and between levels. The independent latent variables COLLABOR and SUPPORT were then included and verified in the unilevel and the two-level CFA models for all of the five latent variables. The measurement of COLLABOR and SUPPORT were modified based on the MIs in order to attain good fitting models. All of the measurement models were run in the statistics software Mplus 6.12.
Unconditional Structural Model

As the measurement of the latent variables was verified, the ML-SEM models were conducted to examine the causal effect of the explanatory variables on teacher motivation. Particularly in the unconditional structural model, the level-1 explanatory variables \(x's\) were added at the within level to explain the within-school variability in teacher motivation. However, none of the level-2 explanatory variables \(w's\) were included at the between level. For illustrative purpose, this section presents the concepts of an unconditional structural model in accordance with the MLM method in order to highlight the structural portion of the model. Consequently, the measurement portion of the model (the relations among the latent and observed variables) is omitted. Insofar as the teacher data were nested in schools, two models were considered to account for the non-independence of the clustered data. First, an ANCOVA model assumes unequal effects (i.e., dependent variable) across treatment groups and equal slopes for the effect of covariates on the dependent variable (Kreft & de Leeuw, 1998). The first level of an ANCOVA model can be written as

\[ Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + r_{ij} \]  \[4.1\]

and at the second level,

\[ \beta_{qj} = \gamma_{q0} \text{ for each } q = 0, 1 \ldots Q \]  \[4.2\]

where \(Q = \) number of explanatory variables at the first level
\(X_{qij} = \) the \(q^{th}\) level-1 explanatory variable for teacher \(i\) in school \(j\)
\(\gamma_{q0} = \) level-2 fixed effect for the \(q^{th}\) level-1 explanatory variable

Since the ANCOVA model estimates random intercepts of the dependent variable with fixed slopes for the effect of covariates, it implies that the effect of level-1 explanatory
variables on the dependent variable (teacher motivation) does not vary across groups (schools). Alternatively, a random coefficients model is similar to an ANCOVA model except that it lifts this restriction and assumes either equal or unequal slopes across groups (Kreft & de Leeuw, 1998). A random coefficients model allows all intercepts and slopes to vary across groups if necessary, but no level-2 explanatory variables are included at the second level. Raudenbush and Bryk (2002) referred to a random coefficients model as an unconditional level-2 model due to its focus on explaining the variability across groups instead of the potential causes. The first level of a generic random coefficients model can be written as

\[ Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + r_{ij} \]  

[5.1]

and at the second level,

\[ \beta_{qij} = \gamma_{q0} + u_{qij} \text{ for each } q = 0, 1 \ldots Q \]  

[5.2]

where \( Q \) = number of explanatory variables at the first level, \( X_{qij} \) = the \( q^{th} \) level-1 explanatory variable for teacher \( i \) in school \( j \), \( \gamma_{q0} \) = level-2 fixed effect for the \( q^{th} \) level-1 explanatory variable, \( u_{qij} \) = level-2 random effects; \( \text{var}(u_{qij}) = \tau_{qq} \) and \( \text{cov}(u_{qij}, u_{q'j}) = \tau_{qq'} \).

A random coefficients model allows all potential effects of level-1 explanatory variables on the dependent variable as well as all potential differences in the dependent variable across level-2 units, but it leaves some between-group variability unexplained. For this study, a random coefficients model seemed more flexible to examine the effect of level-1 explanatory variables on teacher motivation while estimating the random slopes to examine all potential differences of these effects across schools. In the ML-SEM context, however, the number of latent variables being used and the large sample size made the
numerical integration too computationally demanding (Bovaird, 2007; Muthén & Muthén, 1998-2010). Therefore, the researcher utilized the ANCOVA approach, fixing all slopes at first, and explored any potential random slope of each level-1 explanatory variable individually. The expectation maximization (EM) algorithm (Dempster, Laird, & Rubin, 1977) with the rectangular (trapezoid) numerical integration was used as the computational procedure in the two-level models with random slopes (Muthén & Muthén, 1998-2010). The unconditional structural model was conducted to answer the first and the second research questions concerning the effect of teachers’ personal-level motivating factors on their motivation.

During the ML-SEM modeling process, the researcher followed the conventional SEM modeling strategy that considers (1) if the models are theoretically reasonable; (2) if the fit indices suggest a good model fit and if the parameters being estimated are statistically significant; and (3) if the models thoroughly account for potential factors and are parsimonious enough to yield meaningful findings (Byrne, 2012; Schumacker & Lomax, 2010).

**Contextual Model**

The final step of the ML-SEM modeling process was to add level-2 explanatory variables (w’s) to explain the between-group (between-school) variability in the dependent variable (teacher motivation) as well as in the slopes of level-1 explanatory variables. Thus, a contextual model was considered as a complete two-level SEM model that provided evidence to answer the third and the fourth research questions concerning the effect of school-level motivating factors on teacher motivation. In the MLM context, the regression slopes of the level-1 model are presumed to vary nonrandomly and to be
predicted by level-2 variables in a contextual model (Raudenbush & Bryk, 2002). The first level of a generic contextual model can be written as

$$Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + r_{ij}$$  \hspace{1cm} \text{[6.1]}$$

and at the second level,

$$\beta_{qj} = \gamma_{q0} + \sum_{s=1}^{S_{q}} \gamma_{qs} W_{sj} + u_{qj} \text{ for each } q = 0, 1 \ldots Q$$ \hspace{1cm} \text{[6.2]}$$

where

- $S_{q}$ = number of level-2 predictors for the $q^{th}$ level-1 explanatory variable
- $\gamma_{qs}$ = the $s^{th}$ level-2 fixed effect for the $q^{th}$ level-1 explanatory variable
- $W_{sj}$ = the $s^{th}$ level-2 predictor for school $j$

In the ML-SEM context, there were three different ways that the level-2 explanatory variables ($w$’s) were considered to affect teacher motivation. First, $w$’s were used to account for the between-school variability in the dependent latent variables ($RESILI$, $INTEGR$, $COMMIT$), because the invariant factor loadings implied that the within factors had random intercepts at the school level ($RESILI_b$, $INTEGR_b$, $COMMIT_b$) varying across schools. Second, $w$’s were used to explain the different effects of $x$’s on teacher motivation across schools if a certain random slope existed for a level-1 explanatory variable. Third, $w$’s were used to explain the between-school variability in average teachers’ perceived collaboration and school support at the school level. As teachers’ perceived collaboration ($COLLABOR$) and school support ($SUPPORT$) were measured at both the personal and school level with invariant factor loadings across levels, the summary measures at the school level $COLLAB_{b}$ and $SUPPOR_{b}$ could be compared across schools. Thus, the school-level factors or covariates might significantly affect average teachers’ perceived collaboration and school support at a certain school.
Analytical Strategies

Given that most of the survey items used in the present study were originally measured by a Likert scale in the 2007-08 SASS questionnaires, the researcher attempted to use an appropriate estimator during the ML-SEM modeling process that accommodated the non-normality of the Likert-scaled data. The nature of Likert-scaled data is categorical, but it is also appropriate to consider Likert-scaled data as continuous data (Byrne, 2012; Muthén & Muthén, 1998-2010). However, the estimator must accommodate the non-normal distribution of the Likert-scaled data and produce parameter estimates that are robust to the non-normality of observations. Therefore, the researcher considered using the WLSMV estimator (robust weighted least square mean- and variance-adjusted $\chi^2$ test of model fit) and the MLR estimator (maximum likelihood parameter estimates with standard errors and a $\chi^2$ test statistic that are robust to non-normality and non-independence of observations). The WLSMV estimator treats Likert-scaled data as categorical data and produces parameter estimates and a $\chi^2$ statistic that are robust to the non-normality of observations (Byrne, 2012; Muthén, du Toit, & Spisic, 1997), whereas the MLR estimator treats Likert-scaled data as continuous data and uses a sandwich estimator to produce parameter estimates and a $\chi^2$ statistic that are robust to the non-normality and non-independence of observations (Muthén & Muthén, 1998-2010; Muthén, 1998-2004). Even though the WLSMV estimator was preferable because it accommodated the categorical nature of Likert-scaled data, only the MLR estimator could be used to generate the parameter estimates in a multilevel model with the existence of random intercepts and random slopes of the level-1 factors (Muthén & Muthén, 1998-2010). In the present study, the ML-SEM model was developed to
examine the effect of level-1 and level-2 variables on within- and between-school teacher motivation as well as the moderating effect of level-2 variables on the effect of level-1 variables, and it required a two-level model with the random intercepts and the random slopes. For this reason, the researcher first used both estimators and compared the parameter estimates generated by the WLSMV estimator and the MLR estimator, but the MLR estimator was used in the rest of the ML-SEM models.

Another analytical strategy was adopted by the researcher in order to accommodate the large sample size of the 2007-08 SASS data. In the SEM context, the $\chi^2$ model fit tests are often used to determine the degree to which the sample data in the observed covariance matrix ($S$) fit the theoretically hypothesized model by comparing $S$ and the model implied covariance matrix ($\Sigma$). The null hypothesis of the $\chi^2$ model fit test is that the proposed theoretical model holds in the population ($S$ and $\Sigma$ do not differ statistically). If $S$ and $\Sigma$ are significantly different according to the $\chi^2$ distribution with its degree of freedom (i.e., number of free parameters in the model), the null hypothesis is rejected, which suggests a bad model fit (Schumacker & Lomax, 2010). However, the $\chi^2$ test is a test of exact fit and tends to reject the null hypothesis with large samples. Thus, with large sample sizes, the $\chi^2$ test may be significant and suggest a bad model fit even when the fit is good (Schumacker & Lomax, 2010). Considering that the 2007-08 SASS dataset contained (before merging) 38,240 public school teachers at the personal level and 7,459 principals at the school level, the $\chi^2$ test easily rejected the null hypothesis and suggested a bad model fit. Thus, the researcher relied on other model fit indices that were not too sensitive to the sample sizes, such as RMSEA and CFI, to determine the model fit.
of the ML-SEM models. Nonetheless, the $\chi^2$ statistics are still reported in accordance with the conventional SEM results.

Finally, with regard to the procedure of data analyses in the present study, the data merging and descriptive statistics were conducted in Microsoft Excel 2010 and IBM SPSS 19.0. The unilevel CFA models, the two-level CFA models, the unconditional structural model, and the final two-level structural model (contextual model) were conducted in Mplus 6.12. The STDYX standardization was used for the output in Mplus 6.12, which is based on the background and outcome variables (Byrne, 2012; Muthén & Muthén, 1998-2010).

Given the description of the 2007-08 SASS survey data, the survey items used to measure the theoretical constructs proposed in this study, the concept of ML-SEM models, and the modeling process, the results of the analyses are reported and discussed in the next chapter.
Chapter 4: RESULTS

This chapter reports the results of the statistical analyses. First, the descriptive statistics of the combined dataset from the 2007-08 Teacher Questionnaire, the 2007-08 Principal Questionnaire, and the 2007-08 School Questionnaire are reported. Second, the construct of teacher motivation along with its sub-constructs, resilience, integrated regulation, and commitment, are reported. The intra-class correlations (ICC) of teachers’ resilience, integrated regulation, and commitment were calculated to demonstrate the variability in each sub-construct that was contributed by the schools. Based on the verified measurement of teacher motivation, the constructs of teachers’ perceived collaboration and school support were also examined. As the measurement model for all of the latent dependent and independent variables was verified, the multilevel structural equation models (ML-SEM) were applied. The results of the unconditional structural model (no level-2 explanatory variables) and the contextual model (full two-level structural model) are reported.

Process of Data Merging

The survey data examined in the present study came from three questionnaires from the 2007-08 Schools and Staffing Survey (SASS), collected by the National Center for Educational Statistics (NCES). Specifically, the survey data from the 2007-08 Teacher Questionnaire completed by public school teachers, the 2007-08 Principal
Questionnaire completed by public school principals, and the 2007-08 School Questionnaire completed by public schools across the country were merged to establish a dataset for this study. These three questionnaires were merged based on a school identifier, which was recorded in each data file of the questionnaires. The raw survey data files indicated that the 2007-08 Teacher Questionnaire was completed by 38,240 public school teachers across the country; the 2007-08 Principal Questionnaire was completed by 7,459 public school principals across the country; and the 2007-08 School Questionnaire was completed by 7,572 schools across the country. However, some teacher records (used as level-1 data) did not have a corresponding principal or school record (used as level-2 data). In other words, some school identifiers did not exist in all of the three survey data files. In that case, the teacher, principal, or school records were removed when that corresponding school was missing in any of the three data files.

Thus, the dataset used in this study contained the records that were successfully merged from the 2007-08 Teacher Questionnaire, the 2007-08 Principal Questionnaire, and the 2007-08 School Questionnaire based on the school identifier. This combined dataset contained 33,876 public school teachers and 6,876 public school principals (public schools), which were considered the valid sample size at the first and the second level of the ML-SEM models respectively. The descriptive statistics and the results reported in this chapter are also based on this merged dataset.

Descriptive Statistics

The section reports the descriptive statistics of the survey data used in the present study, which was a combined dataset from the 2007-08 Teacher Questionnaire, the 2007-08 Principal Questionnaire, and the 2007-08 School Questionnaire. The successfully
merged data file contained 33,876 teacher records and 6,876 principal (school) records. The descriptive statistics provided important information regarding the psychometric characteristics of the survey data and suggestions on model specifications and analytical strategies.

*Teachers and Principals*

The dataset used in the present study contained 33,876 teachers and 6,876 principals (schools), which were included in the first (within) level and the second (between) level of the ML-SEM models respectively. The 2007-08 SASS administration attempted to collect one to a maximum of 20 teacher samples from each sampled school (Tourkin, et al., 2010), which was confirmed by the combined dataset. Table 2 reports the frequency of the number of sampled teachers at each school. The results suggested that the average number of sampled teachers at each school was 4.927 (approximately 5 teachers), which was considered the average cluster size in the ML-SEM models. In addition, 344 schools only had one teacher surveyed at that particular school. The schools with only one teacher record were included in the sample during the ML-SEM modeling process. Even though the schools with one teacher sample did not provide any within-school information at the first level of the ML-SEM models, they did provide between-school information at the second level of the models (Raudenbush & Bryk, 2002).
<table>
<thead>
<tr>
<th>Sampled Teacher(s)</th>
<th>School n</th>
<th>Percentage</th>
<th>Accumulated Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>344</td>
<td>5.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>2</td>
<td>735</td>
<td>10.7%</td>
<td>15.7%</td>
</tr>
<tr>
<td>3</td>
<td>1211</td>
<td>17.6%</td>
<td>33.3%</td>
</tr>
<tr>
<td>4</td>
<td>1320</td>
<td>19.2%</td>
<td>52.5%</td>
</tr>
<tr>
<td>5</td>
<td>967</td>
<td>14.1%</td>
<td>66.6%</td>
</tr>
<tr>
<td>6</td>
<td>695</td>
<td>10.1%</td>
<td>76.7%</td>
</tr>
<tr>
<td>7</td>
<td>473</td>
<td>6.9%</td>
<td>83.6%</td>
</tr>
<tr>
<td>8</td>
<td>386</td>
<td>5.6%</td>
<td>89.2%</td>
</tr>
<tr>
<td>9</td>
<td>289</td>
<td>4.2%</td>
<td>93.4%</td>
</tr>
<tr>
<td>10</td>
<td>169</td>
<td>2.5%</td>
<td>95.8%</td>
</tr>
<tr>
<td>11</td>
<td>119</td>
<td>1.7%</td>
<td>97.6%</td>
</tr>
<tr>
<td>12</td>
<td>84</td>
<td>1.2%</td>
<td>98.8%</td>
</tr>
<tr>
<td>13</td>
<td>51</td>
<td>0.7%</td>
<td>99.5%</td>
</tr>
<tr>
<td>14</td>
<td>22</td>
<td>0.3%</td>
<td>99.8%</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>0.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td>6876</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Frequency: Number of Sampled Teachers at Each School

**Dependent Variables**

The construct teacher motivation was theorized as a second-order latent variable (TCHER_MO) measured by three sub-constructs (first-order latent variables): resilience (RESILI), integrated regulation (INTEGR), and commitment (COMMIT). Based on the existing literature, eight survey items from the 2007-08 Teacher Questionnaire were used as the observed variables to measure RESILI, INTEGR, and COMMIT. In order to consistently measure the magnitude of teacher motivation, the four-level Likert-scaled data (Strongly agree; Somewhat agree; Somewhat disagree; Strongly disagree) of the negatively stated survey items were reverse coded so that a response of 1 consistently indicated the lowest level of teachers’ positive attitude; and a response of 4 consistently indicated the highest level of teachers’ positive attitude. For example, the item statement [Q57a] “The stress and disappointments involved in teaching at this school aren’t really
worth it” (worthiness) was coded as 1 = Strongly agree; 2 = Somewhat agree; 3 = Somewhat disagree; and 4 = Strongly disagree; so that a greater value of the response indicated the teachers’ attitude to be more positive. The item responses and the descriptive statistics, grouped by their pertinent sub-constructs of teacher motivation, are reported in Table 3.

The descriptive statistics revealed that teachers tended to express a higher level of agreement toward the survey items regarding their motivation. The percentage of teachers who selected the highest level (4) of their positive attitude ranged from 30.9% to 59.0%. Consequently, the data were considerably skewed to the left. The skewness and kurtosis further revealed that the data were not normally distributed. Therefore, the WLSMV estimator and the MLR estimator were used in the ML-SEM modeling process in order to accommodate the non-normality of the data. Nonetheless, the reliability estimate of internal consistency suggested that the eight survey items used to measure teacher motivation were fairly reliable (Cronbach’s α = .835).
Table 3. Descriptive Statistics: Teacher Motivation

<table>
<thead>
<tr>
<th>Sub-Construct (Latent Variable)</th>
<th>Observed Variable</th>
<th>Frequency</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>1 (%)</td>
<td>2 (%)</td>
<td>3 (%)</td>
<td>4 (%)</td>
</tr>
<tr>
<td>Resilience (RESIL)</td>
<td>worthiness</td>
<td>33876</td>
<td>1088</td>
<td>5359</td>
<td>11046</td>
<td>16383</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.2%)</td>
<td>(15.8%)</td>
<td>(32.6%)</td>
<td>(48.4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(3.2%)</td>
<td>(15.8%)</td>
<td>(32.6%)</td>
</tr>
<tr>
<td></td>
<td>enthusiasm</td>
<td>33876</td>
<td>3784</td>
<td>9150</td>
<td>8484</td>
<td>12458</td>
</tr>
<tr>
<td></td>
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<td>(36.8%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(11.2%)</td>
<td>(27.0%)</td>
<td>(25.0%)</td>
</tr>
<tr>
<td></td>
<td>energy</td>
<td>33876</td>
<td>1482</td>
<td>5369</td>
<td>7044</td>
<td>19981</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.4%)</td>
<td>(15.8%)</td>
<td>(20.8%)</td>
<td>(59.0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(4.4%)</td>
<td>(15.8%)</td>
<td>(20.8%)</td>
</tr>
<tr>
<td>Integrated Regulation (INTEGR)</td>
<td>satisfied_person</td>
<td>33876</td>
<td>633</td>
<td>1720</td>
<td>11785</td>
<td>19738</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.9%)</td>
<td>(5.1%)</td>
<td>(34.8%)</td>
<td>(58.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.9%)</td>
<td>(5.1%)</td>
<td>(34.8%)</td>
</tr>
<tr>
<td></td>
<td>satisfied_group</td>
<td>33876</td>
<td>1438</td>
<td>5453</td>
<td>16298</td>
<td>10687</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.2%)</td>
<td>(16.1%)</td>
<td>(48.1%)</td>
<td>(31.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(4.2%)</td>
<td>(16.1%)</td>
<td>(48.1%)</td>
</tr>
<tr>
<td></td>
<td>like_things_run</td>
<td>33876</td>
<td>2051</td>
<td>5641</td>
<td>15718</td>
<td>10466</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(6.1%)</td>
<td>(16.7%)</td>
<td>(46.4%)</td>
<td>(30.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(6.1%)</td>
<td>(16.7%)</td>
<td>(46.4%)</td>
</tr>
<tr>
<td>Commitment (COMMIT)</td>
<td>stay_teaching</td>
<td>33876</td>
<td>3133</td>
<td>6378</td>
<td>10768</td>
<td>13597</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(9.2%)</td>
<td>(18.8%)</td>
<td>(31.8%)</td>
<td>(40.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(9.2%)</td>
<td>(18.8%)</td>
<td>(31.8%)</td>
</tr>
<tr>
<td></td>
<td>stay_school</td>
<td>33876</td>
<td>2480</td>
<td>7182</td>
<td>6979</td>
<td>17235</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(7.3%)</td>
<td>(21.2%)</td>
<td>(20.6%)</td>
<td>(50.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(7.3%)</td>
<td>(21.2%)</td>
<td>(20.6%)</td>
</tr>
</tbody>
</table>

Due to the hierarchical nature of the survey data, there were six focal independent variables at the teachers’ personal level (level 1), two of which were latent variables, and three were at the school level (level 2). The level-1 independent variables (x’s) were measured by the survey items from the 2007-08 Teacher Questionnaire and theorized to explain the within-school variance in teacher motivation, whereas the level-2 independent variables (w’s) were measured by the survey items from the 2007-08 Principal Questionnaire and theorized to explain the between-school variance in teacher motivation.

The descriptive statistics of the independent variables are reported in the next section.

Independent variables at the personal level (level 1)

Teachers’ perceived collaboration (COLLABOR) and perceived school support (SUPPORT) were constructed as two level-1 latent variables in the ML-SEM models.

Based on the existing literature, four survey items were proposed to measure COLLABOR; and five survey items were proposed to measure SUPPORT. The item responses and the
descriptive statistics, grouped by their pertinent constructs, are reported in Table 4.

Similar to the survey items used to measure teacher motivation, the descriptive statistics of the items used to measure COLLABOR and SUPPORT revealed that teachers tended to express a higher level of agreement towards the survey items regarding their perception of the collaboration and school support they had received. The percentage of teachers who selected the highest level (4) of their positive attitude ranged from 21.4% to 55.6%.

The skewness and kurtosis further revealed that the data were skewed to the left and non-normally distributed. However, the reliability estimate of internal consistency suggested that these nine survey items used to measure teachers’ perception (level-1 latent independent variables) were fairly reliable (Cronbach’s $\alpha = .847$).

<table>
<thead>
<tr>
<th>Construct (Latent Variable)</th>
<th>Observed Variables</th>
<th>Frequency</th>
<th>M (SD)</th>
<th>Skewness (SE)</th>
<th>Kurtosis (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Collaboration</td>
<td>consistent_rules</td>
<td>33876</td>
<td>3003 (8.9%)</td>
<td>7958 (23.5%)</td>
<td>2.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8283 (24.5%)</td>
<td>11825 (34.9%)</td>
<td>3.20</td>
</tr>
<tr>
<td></td>
<td>shared_values</td>
<td>33876</td>
<td>714 (2.1%)</td>
<td>10947 (32.3%)</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>3617 (10.7%)</td>
<td>18629 (55.0%)</td>
<td>3.18</td>
</tr>
<tr>
<td></td>
<td>princ_communicate</td>
<td>33876</td>
<td>1159 (3.4%)</td>
<td>10497 (31.8%)</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3141 (9.3%)</td>
<td>18825 (55.6%)</td>
<td>3.18</td>
</tr>
<tr>
<td>Perceived School Support</td>
<td>cooperative_effort</td>
<td>33876</td>
<td>1074 (3.2%)</td>
<td>15235 (45.0%)</td>
<td>3.18</td>
</tr>
<tr>
<td></td>
<td>admin_behavior</td>
<td>33876</td>
<td>1410 (4.2%)</td>
<td>8754 (26.4%)</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td>materials_available</td>
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<td>1525 (4.5%)</td>
<td>12779 (38.2%)</td>
<td>3.25</td>
</tr>
<tr>
<td></td>
<td>rules_enforced</td>
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<td>1253 (3.7%)</td>
<td>10827 (32.0%)</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td>work_recognized</td>
<td>33876</td>
<td>2058 (6.1%)</td>
<td>15055 (45.0%)</td>
<td>3.01</td>
</tr>
<tr>
<td></td>
<td>special_needs</td>
<td>33876</td>
<td>2806 (8.3%)</td>
<td>16028 (47.3%)</td>
<td>2.82</td>
</tr>
</tbody>
</table>

Table 4. Descriptive Statistics: Level-1 Latent IVs
Unlike the constructs of teachers’ perceived collaboration and school support, measured as latent variables, teachers’ content competency ($HQT$), classroom autonomy ($CLASS\_AU$), base salary ($SALARY$), and bonus pay ($BONUS$) were included as level-1 observed independent variables in the ML-SEM models. The descriptive statistics of $HQT$, $CLASS\_AU$, $SALARY$, and $BONUS$ are reported in Table 5.

Based on the existing literature, teachers’ content competency was measured by their HQT status, which was a dichotomous variable (No/Yes) and coded as $0 = \text{No}$; and $1 = \text{Yes}$. The descriptive statistics revealed that out of the 33,876 sampled teachers, 4,143 (12.2%) of them did not have HQT status; and 29,733 (87.8%) had HQT status. The observed item response of teachers’ HQT status ($HQT$) was used as a level-1 explanatory variable to measure teachers’ content competency.

Teachers’ classroom autonomy ($CLASS\_AU$) was a mean score of six survey items inquiring about teachers’ control over their classroom activities. Since a teacher’s classroom autonomy represented a reality of the classroom rather than his or her perception, the mean score was used rather than a latent variable. Nonetheless, the reliability estimate of internal consistency suggested that the six survey items used to measure teachers’ classroom autonomy were fairly reliable (Cronbach’s $\alpha = .724$). The mean score $CLASS\_AU$ shared the same psychometric characteristics as the raw Likert-scaled survey items and was included as a continuous variable in the ML-SEM models.

Teachers’ base salary ($SALARY$) and bonus ($BONUS$) were measured as continuous variables in the 2007-08 Teacher Questionnaire and included as level-1 explanatory variables in the ML-SEM models to measure the external rewards teachers had received. The descriptive statistics suggested that the average annual salary of the
33,876 sampled teachers was $44,956.57 (SD = $13,699.05); and the average bonus pay of the 33,876 sampled teachers was $314.33 (SD = $1,407.70). The skewness and kurtosis further suggested that \textit{SALARY} and \textit{BONUS} were considerably skewed to the right and non-normally distributed. Thus, the MLR estimator appeared to be an appropriate estimator used in the ML-SEM models, because it accommodated the non-normally distributed data and generated parameter estimates and $\chi^2$ statistics that were robust to non-normality (Muthén & Muthén, 1998-2010).

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Group</th>
<th>n (%)</th>
<th>$M$ (SD)</th>
<th>Skewness (SE)</th>
<th>Kurtosis (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{HQT}</td>
<td>33876</td>
<td>0 (No)</td>
<td>4143 (12.2%)</td>
<td>3.39 (.51)</td>
<td>-903 (.013)</td>
<td>762 (.027)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (Yes)</td>
<td>29733 (87.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{CLASS_AU}</td>
<td>33876</td>
<td></td>
<td></td>
<td>4.39</td>
<td>-903 (.013)</td>
<td>762 (.027)</td>
</tr>
<tr>
<td>\textit{SALARY}</td>
<td>33876</td>
<td></td>
<td></td>
<td>44956.57 (13699.05)</td>
<td>0.724 (.013)</td>
<td>1.569 (.027)</td>
</tr>
<tr>
<td>\textit{BONUS}</td>
<td>33876</td>
<td></td>
<td></td>
<td>314.33 (1407.70)</td>
<td>13.054 (.013)</td>
<td>293.846 (.027)</td>
</tr>
</tbody>
</table>

Table 5. Descriptive Statistics: Level-1 Observed IVs

\textit{Independent variables at the school level (level 2)}

There were three independent variables (w’s) at the school level (level 2), including teachers’ participation in decision making on school activities (\textit{TCHER\_PA}), principals’ control over school activities (\textit{PRINC\_CO}), and opportunities of professional development provided for teachers (\textit{TCHER\_PD}). Insofar as these variables measured the reality of a certain school rather than an individual’s perception, a mean score was created based on the item responses for each variable. Consequently, these level-2
explanatory variables shared the same psychometric characteristics as the raw Likert-scaled survey items from the 2007-08 Principal Questionnaire. The descriptive statistics of these level-2 explanatory variables are reported in Table 6. The descriptive statistics suggested that TCHER_PA, PRINC_CO, and TCHER_PD were considerably skewed and non-normally distributed. However, the reliability estimate of internal consistency suggested that the seven survey items used to measure TCHER_PA were fairly reliable (Cronbach’s α = .692), as were the seven survey items used to measure PRINC_CO (Cronbach’s α = .644) and the eight survey items used to measure TCHER_PD (Cronbach’s α = .820).

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M (SD)</th>
<th>Skewness (SE)</th>
<th>Kurtosis (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCHER_PA</td>
<td>6876</td>
<td>3.19 (.47)</td>
<td>-.550 (.030)</td>
<td>.116 (.059)</td>
</tr>
<tr>
<td>PRINC_CO</td>
<td>6876</td>
<td>3.72 (.30)</td>
<td>-1.559 (.030)</td>
<td>3.624 (.059)</td>
</tr>
<tr>
<td>TCHER_PD</td>
<td>6876</td>
<td>3.79 (.53)</td>
<td>-.260 (.030)</td>
<td>.377 (.059)</td>
</tr>
</tbody>
</table>

Table 6. Descriptive Statistics: Level-2 IVs

Covariates

Three personal-level covariates and two school-level covariates were included in the ML-SEM models to account for the potential effect of teachers’ and schools’ characteristics on teacher motivation. The descriptive statistics of these covariates are reported in Table 7. At the personal level, teachers’ teaching experience (YR_EXP), master’s degree (MASTER), and gender (GENDER) were used as level-1 covariates.
Teachers’ years of experience \((YR_{\text{EXP}})\) was a continuous variable, whereas \(MASTER\) (No/Yes) and \(GENDER\) (Female/Male) were dichotomous variables. The descriptive statistics revealed that the average years of experience of the 33,876 sampled teachers was 12.91 years \((SD = 10.21)\). In addition, the skewness and kurtosis suggested that \(YR_{\text{EXP}}\) were not normally distributed. Teachers’ master’s degree \((MASTER)\) was coded as 0 = No; and 1 = Yes. The descriptive statistics suggested that 16,151 (47.7%) sampled teachers had a master’s degree. Teachers’ gender \((GENDER)\) was coded as 0 = Female; and 1 = Male. The descriptive statistics revealed that 10,440 (30.8%) sampled teachers were male.

At the school level, school size \((SIZE)\) and percentage of minority students \((MINORITY)\) were used as level-2 covariates. Both \(SIZE\) and \(MINORITY\) were measured as continuous variables. The descriptive statistics revealed that the average size of the 6,876 sampled school was approximately 630 enrolled students \((M = 628.82; SD = 540.82)\); and the average percentage of minority students was 34.2% \((SD = 32.1\%)\). The skewness and kurtosis further suggested that \(SIZE\) and \(MINORITY\) were not normally distributed.
Construct of Teacher Motivation

The first step of the ML-SEM modeling process was to verify the proposed theoretical construct of teacher motivation. The researcher attempted to confirm the measurement of teacher motivation before introducing any other explanatory variables or covariates into the ML-SEM models. Thus, a unilevel confirmatory factor analysis (CFA) was first conducted to verify the proposed construct of teacher motivation at the personal level measured by the eight survey items (observed variables). After a good-fitting unilevel CFA model was attained, a two-level CFA model was then built to further verify the construct of teacher motivation at the school level.

*Teacher Motivation as a Second-Order Latent Variable*

The construct of teacher motivation (*TCHER_MO*) was proposed to be measured as a second-order latent variable that consisted of three sub-constructs (measured by three first-order latent variables), including resilience (*RISILI*), integrated regulation (*INTEGR*), and commitment (*COMMIT*). The descriptive statistics revealed that the Likert-scaled survey data of these eight survey items were not normally distributed. Therefore, the
WLSMV estimator and the MLR estimator were used to generate parameter estimates and a $\chi^2$ statistic that were robust to the non-normality of observations. The WLSMV estimator treated the Likert-scaled data as categorical data, whereas the MLR estimator treated the Likert-scaled data as continuous data. Nonetheless, both estimators were robust to the non-normality of observations. Thus, the parameter estimates generated by the WLSMV and MLR estimator were compared to ensure the quality of the MLR estimator, because only the MLR estimator could be used in the succeeding ML-SEM models that contained both random intercepts and random slopes of the level-1 variables.

Therefore, a unilevel CFA model that contained TCHER_MO as the second-order latent variable, measured by three first-order latent variables RESILI, INTEGR, and COMMIT, was conducted with the WLSMV and MLR estimator. The researcher attempted to use this unilevel CFA model to (1) examine the proposed theoretical construct of teacher motivation at the personal level without taking schools into consideration; and (2) compare the parameter estimates produced by the WLSMV and MLR estimator. The unilevel CFA results with the WLSMV estimator are reported in Table 8; and the unilevel CFA results with the MLR estimator are reported in Table 9. Due to the large sample sizes of the dataset used in the present study ($N = 33,876$), the $\chi^2$ model fit tests suggested a bad model fit (WLSMV $\chi^2_{14} = 2501.682, p < .001$; MLR $\chi^2_{14} = 1338.243, p < .001$). Considering that the $\chi^2$ model fit tests were sensitive to the large sample sizes and easily rejected the null hypothesis, the fit indices RMESA and CFI were used to determine the overall model fit. The results of the model with WLSMV estimator suggested a moderate model fit (RMSEA = .072; CFI = .989); and the results of the
model with MLR estimator also suggested a moderate to good model fit (RMSEA = .053; CFI = .981).

Three sets of residual covariances among the observed variables were freed and estimated in the unilevel CFA models. The estimates of these residual covariances are also reported in Table 8 and Table 9. These three sets of free residual covariances appeared to be theoretically reasonable due to the potential bias in the survey item responses. The first set of residual covariance was between satisfied_group and like_things_run. These two items were the only survey items that were positively stated out of the seven items in the pertinent section concerning teachers’ attitude. It was then reasonable to presume that teachers’ responses to these two items could be consistently biased if they did not pay attention to the scales while filling out the survey. The second set of residual covariance was between enthusiasm and energy. Both items appeared to measure teachers’ emotional exhaustion yet from a different time perspective: Survey item enthusiasm attempted to compare teachers’ current enthusiasm to their enthusiasm at the beginning of their teaching career, whereas survey item energy inquired about teachers’ current emotional status. Thus, it was reasonable to presume that these two items might confuse some teachers and result in correlated biased responses. The last set of residual covariance was between stay_teaching and enthusiasm. These two survey items again inquired about teachers’ time perspective as well as the idea of entering or leaving the profession. Therefore, a residual covariance between these two items seemed reasonable, because teachers’ potential bias in response to these two items might be correlated.
The standardized (STDYX in Mplus 6.12) factor loadings of the eight survey items (observed variables) on their pertinent sub-constructs of teacher motivation (first-order latent variables) and the proportion of variance in each survey item explained by its pertinent sub-construct are also reported in Table 8 and Table 9. The unilevel CFA results with the WLSMV estimator suggested that the survey item *worthiness* contributed most strongly to the sub-construct *RESILI* and had the largest standardized factor loading (.856) as compared to *enthusiasm* (.644) and *energy* (.560). The survey item *satisfied_person* contributed most strongly to the sub-construct *INTEGR* and had the largest standardized factor loading (.935) as compared to *satisfied_group* (.713) and *like_things_run* (.749). The survey item *stay_school* contributed most strongly to the sub-construct *COMMIT* and had a larger standardized factor loading (.764) than *stay_teaching* (.580). The WLSMV $R^2$'s further revealed the proportion of variance in each survey item that was accounted for by its pertinent sub-construct. For example, 73.2% of the variance in *worthiness* was accounted for by the *RESILI*; 87.4% of the variance in *satisfied_person* was accounted for by *INTEGR*; and 58.4% of the variance in *stay_school* was accounted for by *COMMIT*.

The unilevel CFA results with the MLR estimator revealed a fairly similar measurement for the construct of teacher motivation and suggested that the survey item *worthiness* contributed most strongly to the sub-construct *RESILI* and had the largest standardized factor loading (.778) as compared to *enthusiasm* (.589) and *energy* (.480). The survey item *satisfied_person* contributed most strongly to the sub-construct *INTEGR* and had the largest standardized factor loading (.831) as compared to *satisfied_group* (.643) and *like_things_run* (.690). The survey item *stay_school* contributed most strongly
to the sub-construct *COMMIT* and had a larger standardized factor loading (.677) than *stay_teaching* (.534). Although the proportion of variance in each survey item that was accounted for by its pertinent sub-construct indicated by the MLR $R^2$’s was slightly less than the proportion suggested by the WLSMV $R^2$’s, the MLR $R^2$’s revealed a similar pattern of the explained proportion of variance in the survey items. For instance, 60.5% of the variance in *worthiness* was accounted for by *RESILI*; 69.1% of the variance in *satisfied_person* was accounted for by *INTEGR*; and 45.8% of the variance in *stay_school* was accounted for by *COMMIT*.

The factor loadings of the three sub-constructs *RESILI*, *INTEGR*, and *COMMIT* (first-order latent variables) on the construct *TCHER_MO* (second-order latent variable) are also reported in Table 8 and Table 9. The WLSMV standardized factor loadings suggested that *RESILI* (.948), *INTEGR* (.887), and *COMMIT* (.975) all significantly loaded on the second-order latent variable *TCHER_MO*. The WLSMV $R^2$’s further revealed that a great proportion of the variance in *RESILI* (89.9%), *INTEGR* (78.7%), and *COMMIT* (95.0%) was accounted for by *TCHER_MO*. The MLR standardized factor loadings provided fairly similar results and suggested that *RESILI* (.949), *INTEGR* (.893), and *COMMIT* (.972) all significantly loaded on *TCHER_MO*. The MLR $R^2$’s also indicated a large proportion of the variance in *RESILI* (90.0%), *INTEGR* (79.7%), and *COMMIT* (94.6%) was accounted for by *TCHER_MO*.

The results of these two unilevel CFA models with different estimators suggested that the WLSMV estimator and the MLR estimator generated similar results in terms of the model fit and the parameter estimates. Therefore, the MLR estimator was used for the succeeding ML-SEM models during the modeling process, because the MLR estimator
accommodated the ML-SEM models that contained both random intercepts and random slopes of the level-1 variables.

Although the unilevel CFA model that contained teacher motivation (TCHER_MO) as a second-order latent variable, measured by three first-order latent variables RESILI, INTEGR, and COMMIT, had a good model fit, the modification indices (MIs) strongly recommended that the survey items stay_teaching and stay_school should load on RESILI or INTEGR. However, the existing literature has suggested that stay_teaching and stay_school should be linked to teachers’ commitment rather than their resilience or integrated regulation. In accordance with the MIs and the theoretical soundness, therefore, an alternative measurement model was proposed to illustrate the construct of teacher motivation. In this alternative measurement model, teacher motivation (TCHER_MO) was no longer measured as a second-order latent variable. Instead, three sub-constructs were used as the only latent variables; and COMMIT was theorized as the outcome of RESILI and INTEGR. In other words, the modified measurement model for teacher motivation attempted to estimate the effect of teachers’ resilience and integrated regulation on their commitment to stay at their schools or remain teaching. The results of the alternative measurement model for teacher motivation are reported in the next section.
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<th>Tests of Model Fit</th>
<th>Statistics</th>
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<td>CFI: .989</td>
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<table>
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<th>$z$</th>
<th>$R^2$</th>
<th>Residual Variance</th>
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<td>.644</td>
<td>.004</td>
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<td>.415</td>
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<td>.560</td>
<td>.005</td>
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<td>.005</td>
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</tr>
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<td>.948</td>
<td>.004</td>
<td>253.513*</td>
<td>.899</td>
</tr>
<tr>
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<td>.887</td>
<td>.003</td>
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<td>.006</td>
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Table 8. Unilevel CFA Results: Teacher Motivation as Second-Order (WLSMV)

*Significant at $\alpha = .001$. 

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Commitment as an Outcome of Resilience and Integrated Regulation

In the revised unilevel measurement model for teacher motivation, teachers’ commitment (COMMIT) was theorized as the outcome of their resilience (RESILI) and integrated regulation (INTEGR). Insofar as the WLSMV estimator and the MLR estimator provided fairly similar results in terms of the model fit and the parameter estimates, the MLR estimator was used in the rest of the ML-SEM modeling process. The results of the revised unilevel measurement model for teacher motivation are reported in Table 10. The results suggested a moderate to good model fit (RMSA = .053; CFI = .981),
and the factor loadings of the survey items on their pertinent latent variables (*RESILI*, *INTEGR*, and *COMMIT*) were identical to the factor loadings estimated by the initial unilevel CFA model with the MLR estimator. The $R^2$'s also indicated the same amount of variance in each survey item explained by its pertinent latent variable as compared to the results of the initial unilevel CFA model with the MLR estimator. Nonetheless, the revised measurement model for teacher motivation estimated two regression paths (regression coefficients) from *RESILI* and *INTEGR* to *COMMIT*, indicating the linear regression of *COMMIT* on *RESILI* and *INTEGR*. The results of this linear regression can be written as

$$COMMIT = .684(RESILI) + .354(INTEGR) + r_{ij}$$

The results suggested that both regression coefficients were statistically significant ($p < .001$) and indicated that 87.8% of the variance in teachers’ commitment (*COMMIT*) was accounted for by their resilience (*RESILI*) and integrated regulation (*INTEGR*). The results agreed with the modification made to the initial CFA model, which reconceptualized *COMMIT* to be influenced by *RESILI* and *INTEGR* instead of the third sub-construct, along with *RESILI* and *INTEGR*, used to measure the second-order latent variable *TCHER_MO*. In addition, there were no other MIs that recommended any significant modification to the model. Therefore, the revised measurement model for teacher motivation in which *COMMIT* was theorized as the outcome of *RESILI* and *INTEGR* was used as the structure that illustrated teacher motivation in the succeeding ML-SEM models. The originally proposed and the modified structures of the three sub-constructs portraying teacher motivation are illustrated in Figure 2.
### Tests of Model Fit

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Fit Index

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<td>CFI</td>
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<th>$z$</th>
<th>$R^2$</th>
<th>Residual Variance</th>
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</thead>
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<td></td>
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<td>.605</td>
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<td>enthusiasm</td>
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<td>.005</td>
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<td>energy</td>
<td>.661</td>
<td>.480</td>
<td>.006</td>
<td>81.704*</td>
<td>.231</td>
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</tr>
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<td>satisfied_person</td>
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<td>.831</td>
<td>.004</td>
<td>217.839*</td>
<td>.691</td>
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<td>satisfied_group</td>
<td>.881</td>
<td>.643</td>
<td>.005</td>
<td>132.716*</td>
<td>.413</td>
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<td>like_things_run</td>
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<td>.690</td>
<td>.004</td>
<td>155.191*</td>
<td>.477</td>
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<td></td>
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<tr>
<td>stay_teaching</td>
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<td>.534</td>
<td>.006</td>
<td>89.406*</td>
<td>.285</td>
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<td>stay_school</td>
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<td>.677</td>
<td>.006</td>
<td>114.523*</td>
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<tr>
<td><strong>COMMIT on</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RESILI</td>
<td>.684</td>
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<td>.026</td>
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<td>RESILI</td>
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</tr>
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</tr>
<tr>
<td>satisfied_group with like_things_run</td>
<td>.143</td>
<td>.381</td>
<td>.007</td>
<td>51.217*</td>
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<td>enthusiasm with energy</td>
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<td>.230</td>
<td>.006</td>
<td>36.310*</td>
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<tr>
<td>stay_teaching with enthusiasm</td>
<td>.118</td>
<td>.171</td>
<td>.007</td>
<td>26.064*</td>
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</tbody>
</table>

Table 10. Unilevel Measurement of Teacher Motivation: Commitment as Outcome

*Significant at $\alpha = .001$. 

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The revised unilevel measurement model for teacher motivation suggested that teachers’ commitment (COMMIT) was significantly influenced by their resilience (RESILI) and integrated regulation (INTEGR). Therefore, this structure of teacher motivation was used to develop the two-level measurement model for teacher motivation. The intra-class correlations (ICC) in teacher motivation was calculated before the two-level models were built because the ICCs provided information on the proportion of the variance in the dependent variable that was contributed by the clusters (schools) and further indicated whether it was necessary to conduct the two-level models. Insofar as teacher motivation was measured by three latent variables, RESILI, INTEGR, and COMMIT, the ICCs of the survey items that were used to measure these sub-constructs were calculated. Table 11 reports the item ICCs grouped by their pertinent sub-constructs.
(latent variables). The ICCs of the items used to measure RESILI, including worthiness, enthusiasm, and energy, ranged from 3.3% to 8.1%; the ICCs of the items used to measure INTEGR, including satisfied_person, satisfied_group, and like_things_run, ranged from 10.5% to 21.4%; and the ICCs of the items used to measure COMMIT, including stay_teaching and stay_school, were 5.2% and 9.4% respectively. Given that the ICCs of the items used to measure each sub-construct of teacher motivation were greater than zero, indicating that a proportion of the variance in teacher motivation was contributed by schools, it was necessary and appropriate to conduct the two-level models to examine teacher motivation within the school context.

<table>
<thead>
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<th>Item ICC</th>
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<td><strong>RESILI by</strong></td>
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<td>worthiness</td>
</tr>
<tr>
<td>enthusiasm</td>
</tr>
<tr>
<td>energy</td>
</tr>
<tr>
<td><strong>INTEGR by</strong></td>
</tr>
<tr>
<td>satisfied_person</td>
</tr>
<tr>
<td>satisfied_group</td>
</tr>
<tr>
<td>like_things_run</td>
</tr>
<tr>
<td><strong>COMMIT by</strong></td>
</tr>
<tr>
<td>stay_teaching</td>
</tr>
<tr>
<td>stay_school</td>
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Table 11. ICC of Survey Items Used to Measure Teacher Motivation

In addition to the ICCs of the survey items used to measure the sub-constructs of teacher motivation, the ICCs of the latent variables used to portray teacher motivation were also calculated. The ICCs of the latent variables were calculated in a two-level CFA model that only contained the eight survey items linked to their pertinent sub-constructs
of teacher motivation (latent variables) without any explanatory variables (an empty model). At the within-school level (level 1), three latent variables RESILI, INTEGR, and COMMIT, were theorized to measure individual teachers’ resilience, integration regulation, and commitment. At the between-school level (level 2), three latent variables RESILI_b, INTEGR_b, and COMMIT_b, were theorized to measure the average teachers’ resilience, integrated regulation, and commitment at that certain school. Since the measurement of RESILI, INTEGR, and COMMIT was already verified by the unilevel CFA model, three sets of the residual covariances (satisfied_group with like_things_run; enthusiasm with energy; stay_teaching with enthusiasm) were estimated at the within level. In addition, the factor loadings were constrained to be equal across the within and between levels to imply that the within factors had random intercepts varying across schools (Byrne, 2012; Muthén & Muthén, 1998-2010). The invariant factor loadings also made the variance of the latent variables directly comparable across levels (Mehta & Neale, 2005). Table 12 reports the results of the two-level CFA model for teacher motivation.

The two-level CFA results suggested that the within-school variance of teachers’ resilience (RESILI) was .375, and the between-school variance of teachers’ resilience at the school level (RESILI_b) was .050. Thus, the proportion of the variance in teachers’ resilience contributed by schools was 11.8% (ICC = .050 / [.050 + .375]). Similarly, 24.0% of the variance in teachers’ integrated regulation was contributed by schools (ICC = .087 / [.087 + .275]); and 15.8% of the variance in teachers’ commitment was contributed by schools (ICC = .072 / [.072 + .384]). Given that the measurement errors existed in the observed variables (survey items) and that three sets of the residual
covariances between the survey items were estimated in the two-level CFA model, the ICC of each latent variable was not necessarily within the range of the ICCs of its pertinent observed variables (Bauer, 2003; Muthén, 1991). Nonetheless, the non-zero ICCs of the latent variables agreed with the non-zero item ICCs and provided evidence supporting the use of ML-SEM models to accommodate the hierarchical structure of the 2007-08 SASS survey data.
## Tests of Model Fit

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<tr>
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<th>CFI</th>
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### Within Level

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### Between Level

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<td>.565</td>
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Table 12. Two-Level CFA Results: Sub-Constructs of Teacher Motivation

*Significant at $\alpha = .001$.  

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Two-Level Measurement Model for Teacher Motivation

Because the non-zero ICCs of teachers’ resilience, integrated regulation, and commitment suggested that a proportion of the variance in teacher motivation was contributed by schools, a two-level measurement model for teacher motivation was conducted to verify the construct of teacher motivation while accounting for the non-independent nature of the teacher data nested in schools. Based on the good fitting unilevel measurement model for teacher motivation, teachers’ commitment (COMMIT) was theorized as the outcome of resilience (RESILI) and integrated regulation (INTEGR) at the within-school level. The structure of the between level resembled the within level so that the average teachers’ commitment at a certain school (COMMIT\_b) was influenced by their average resilience (RESILI\_b) and integrated regulation (INTEGR\_b) at the school level. The factor loadings for the latent variables were constrained to be invariant across the within and between levels so that the average teachers’ resilience, integrated regulation, and commitment at the school level could be compared across schools (Byrne, 2012; Mehta & Neale, 2005; Muthén & Muthén, 1998-2010). Being verified in the unilevel measurement model for teacher motivation, three sets of the residual covariances (satisfied\_group with like\_things\_run; enthusiasm with energy; stay\_teaching with enthusiasm) were estimated at the within level. However, the residual variances for the observed variables were practically estimated at zero at the between level (Bauer, 2003; Mehta & Neale, 2005).

Table 13 reports the results of the two-level measurement model for teacher motivation. The factor loadings for RESILI\_b, INTEGR\_b, and COMMIT\_b at the between level are omitted in Table 13 because they were constrained to be invariant to
the factor loadings for \textit{RESILI, INTEGR}, and \textit{COMMIT} at the within level. The fit indices suggested a good model fit (RMESA = .045; CFI = .961) and indicated that teachers’ resilience, integrated regulation, and commitment were appropriately measured by the pertinent survey items at both the teachers’ personal level and school level.

Since the non-independence of the teacher data nested in schools was accounted for in the two-level measurement model, the factor loadings for the latent variables \textit{RESILI, INTEGR}, and \textit{COMMIT} appeared to be slightly different from the factor loadings estimated in the unilevel measurement model. For example, the standardized factor loading of \textit{worthiness} on \textit{RESILI} changed from .778 to 758, but it remained as the survey item that contributed most strongly to \textit{RESILI}. Similarly, \textit{satisfied_person} remained as the survey item that contributed most strongly to \textit{INTEGR} even though its standardized factor loading changed from .831 to 767; and \textit{stay_school} remained as the survey item that contributed most strongly to \textit{COMMIT} even though its standardized factor loading changed from .677 to .646. In addition, the proportion of the variance in each observed variable that was explained by its pertinent latent variable also appeared to be slightly different from the proportion indicated by the unilevel measurement model. For instance, 60.5\% of the variance in \textit{worthiness} was explained by \textit{RESILI} in the unilevel measurement model, but it dropped to 57.4\% in the two-level measurement model. Likewise, the proportion of the variance in \textit{satisfied_person} explained by \textit{INTEGR} dropped from 69.1\% to 58.9\%; and the proportion of the variance in \textit{stay_school} explained by \textit{COMMIT} dropped from 45.8\% to 41.7\%.

The regression coefficients estimated for the regression paths from \textit{RESILI} and \textit{INTEGR} to \textit{COMMIT} at the within level slightly changed in the two-level measurement
model as compared to the regression coefficients estimated in the unilevel measurement model. However, both regression coefficients remained significant ($p < .001$). The two-level measurement model suggested that 89.0% of the variance in individual teachers’ commitment to their schools or to the teaching profession ($COMMIT$) was explained by their resilience at work ($RESILI$) and integrated regulation ($INTEGR$). The results of this linear regression can be written as

$$COMMIT = .649(RESILI) + .395(INTEGR) + r_{ij}$$  \[7.2\]

At the between level, the results of the two-level measurement model suggested that 82.2% of the between-school variance in average teachers’ commitment at the school level ($COMMIT_b$) was accounted for by average teachers’ resilience ($RESILI_b$) and integration ($INTEGR_b$). The results of this linear regression at the between level can be written as

$$COMMIT_b = .864(RESILI_b) + .183(INTEGR_b) + u_j$$  \[7.3\]

The regression coefficient of $RESILI_b$ on $COMMIT_b$ was not statistically significant ($p = .065$). Accordingly, the results indicated that average teachers’ commitment at the school level was significantly affected by their average resilience rather than their average integrated regulation at the school level.
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Table 13. Two-Level Measurement of Teacher Motivation: Commitment as Outcome

*Significant at $\alpha = .001$.
†$p = .065$. 

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Constructs of Perceived Collaboration and School Support

As the theoretical construct of teacher motivation was verified in the unilevel measurement model and the two-level measurement model, in which three latent variables RESILI, INTEGR, and COMMIT were used to portray teacher motivation, the independent latent variables were added into the measurement models to further verify the constructs of teachers’ perceived collaboration (COLLABOR) and school support (SUPPORT). Specifically, a unilevel CFA model that contained all of the five latent variables was conducted, and based on the unilevel CFA results, a two-level CFA model that contained all of the five latent variables was conducted. The MLR estimator was used in these measurement models. The results of the unilevel CFA model that contained all of the five latent variables are reported in Table 14.

Two survey items that were originally theorized to measure the independent latent variables were removed from the unilevel CFA model based on the MIs during the preliminary modeling process (the results are omitted). Specifically, the MIs suggested excluding the survey item princ_communicate as an observed variable used to measure COLLABOR and excluding rules_enforced as an observed variable used to measure SUPPORT. In review of the item statements, it was theoretically reasonable to remove these two survey items. With regard to the removal of princ_communicate used to measure COLLABOR, this survey item might be interpreted as an inquiry about the effectiveness of principals’ communication on school visions or goals with the staff rather than the direct quality of the collaboration among teachers, which was clearly addressed by the other three survey items linked to COLLABOR. With regard to the removal of rules_enforced used to measure SUPPORT, this survey item might be
interpreted as an inquiry about school policies and support related particularly to student misconduct rather than personal or academic support that teachers received at work in general, which was clearly addressed by the other four survey items linked to SUPPORT.

In addition to the three sets of residual covariances (satisfied_group with like_things_run; enthusiasm with energy; stay_teaching with enthusiasm) verified in the measurement models for teacher motivation, two more sets of the residual covariances among the observed variables were freed and estimated in the unilevel CFA model that contained all of the five latent variables. These two sets of free residual covariances also appeared to be theoretically reasonable due to the potential bias in the survey item responses. The first set of the residual covariance was between admin_behavior and like_things_run. It was likely that teachers’ perception of their principal’s supportive attitude at that school was confounded with their attitude towards the way things were run at that school. Thus, it was reasonable to presume that the bias of the responses to admin_behavior and like_things_run was correlated. The second set of the residual covariance was between consistent_rules and cooperative_effort. Since other teachers’ help enforcing the rules for student behavior required cooperative effort among the staff members at that school, teachers might have a consistent bias towards these two survey items due to the different level of their own cooperative experiences with their colleagues.

The model fit indices suggested a good model fit (RMSEA = .047; CFI = .962) and revealed that all of the five latent variables RESILI, INTEGR, COMMIT, COLLABOR, and SUPPORT were appropriately measured at the teachers’ personal level. Thus, a two-level CFA model that contained all of the five latent variables was conducted to further verify these theoretical constructs at both the within and between levels, while accounting
for the non-independence of the teacher data clustered in schools. Since the factor loadings of the survey items on the latent variables estimated in these two models were fairly close to each other, the factor loadings estimated in the unilevel CFA model are not discussed, but the factor loadings estimated in the two-level CFA model are discussed in the next section.
## Tests of Model Fit

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<th>SE</th>
<th>$z$</th>
<th>$R^2$</th>
<th>Residual Variance</th>
</tr>
</thead>
</table>

### RESILI by
- **worthiness**
  - Estimate: 1.000
  - Standardized Estimate: .776
  - SE: .005
  - $z$: 167.628*
  - $R^2$: .602
  - Residual Variance: .398

- **enthusiasm**
  - Estimate: .935
  - Standardized Estimate: .590
  - SE: .005
  - $z$: 119.263*
  - $R^2$: .348
  - Residual Variance: .652

- **energy**
  - Estimate: .666
  - Standardized Estimate: .482
  - SE: .006
  - $z$: 82.445*
  - $R^2$: .233
  - Residual Variance: .767

### INTEGR by
- **satisfied_person**
  - Estimate: .833
  - Standardized Estimate: .768
  - SE: .003
  - $z$: 226.376*
  - $R^2$: .590
  - Residual Variance: .410

- **satisfied_group**
  - Estimate: .877
  - Standardized Estimate: .689
  - SE: .004
  - $z$: 157.262*
  - $R^2$: .474
  - Residual Variance: .526

- **like_things_run**
  - Estimate: 1.000
  - Standardized Estimate: .743
  - SE: .004
  - $z$: 185.413*
  - $R^2$: .552
  - Residual Variance: .448

### COMMIT by
- **stay_teaching**
  - Estimate: .773
  - Standardized Estimate: .534
  - SE: .006
  - $z$: 88.796*
  - $R^2$: .284
  - Residual Variance: .716

- **stay_school**
  - Estimate: 1.000
  - Standardized Estimate: .678
  - SE: .006
  - $z$: 113.928*
  - $R^2$: .460
  - Residual Variance: .540

### COLLABOR by
- **consistent_rules**
  - Estimate: 1.000
  - Standardized Estimate: .766
  - SE: .005
  - $z$: 148.902*
  - $R^2$: .587
  - Residual Variance: .413

- **shared_values**
  - Estimate: .672
  - Standardized Estimate: .651
  - SE: .005
  - $z$: 135.615*
  - $R^2$: .423
  - Residual Variance: .577

- **cooperative_effort**
  - Estimate: .965
  - Standardized Estimate: .845
  - SE: .005
  - $z$: 179.704*
  - $R^2$: .714
  - Residual Variance: .268

### SUPPORT by
- **admin_behavior**
  - Estimate: .862
  - Standardized Estimate: .691
  - SE: .005
  - $z$: 152.987*
  - $R^2$: .477
  - Residual Variance: .523

- **materials_available**
  - Estimate: .554
  - Standardized Estimate: .426
  - SE: .006
  - $z$: 76.088*
  - $R^2$: .182
  - Residual Variance: .818

- **work_recognized**
  - Estimate: 1.000
  - Standardized Estimate: .747
  - SE: .004
  - $z$: 197.809*
  - $R^2$: .558
  - Residual Variance: .442

- **special_needs**
  - Estimate: .677
  - Standardized Estimate: .504
  - SE: .005
  - $z$: 98.768*
  - $R^2$: .254
  - Residual Variance: .746

### INTEGR with RESILI
- **RESILI**
  - Estimate: .346
  - Standardized Estimate: .847
  - SE: .005
  - $z$: 159.880*

### COMMIT with RESILI
- **RESILI**
  - Estimate: .405
  - Standardized Estimate: .922
  - SE: .008
  - $z$: 119.780*

### COLLABOR with RESILI
- **RESILI**
  - Estimate: .367
  - Standardized Estimate: .864
  - SE: .007
  - $z$: 124.441*

### SUPPORT with RESILI
- **RESILI**
  - Estimate: .316
  - Standardized Estimate: .718
  - SE: .005
  - $z$: 131.320*

### Residual Cov/Corr
- **satisfied_group with like_things_run**
  - Estimate: .097
  - Standardized Estimate: .296
  - SE: .009
  - $z$: 34.000*

- **enthusiasm with energy**
  - Estimate: .149
  - Standardized Estimate: .228
  - SE: .006
  - $z$: 36.001*

- **stay_teaching with enthusiasm**
  - Estimate: .118
  - Standardized Estimate: .172
  - SE: .007
  - $z$: 26.141*

- **admin_behavior with like_things_run**
  - Estimate: .083
  - Standardized Estimate: .252
  - SE: .007
  - $z$: 37.777*

- **consistent_rules with cooperative_effort**
  - Estimate: -.129
  - Standardized Estimate: -.535
  - SE: .027
  - $z$: -20.026*

*Significant at $\alpha = .001$.

Table 14. Unilevel CFA Results: All Latent DVs and IVs

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Two-Level Measurement Model

Like the two-level measurement model for teacher motivation, the factor loadings for all of the five latent variables in the two-level CFA model were constrained to be invariant across the within and between levels to imply that the within factors had random intercepts varying across schools (Bauer, 2003; Byrne, 2012; Mehta & Neale, 2005). Table 15 reports the results of the two-level CFA model for all of the five latent variables. The fit indices suggested a good model fit (RMSEA = .040; CFI = .937) and indicated that in addition to teachers’ resilience, integrated regulation, and commitment, the theoretical constructs of teachers’ perceived collaboration and school support were also appropriately measured at both the within and between levels.

The factor loadings for the independent latent variables are also reported in Table 15. With regard to teachers’ perceived collaboration, the results suggested that the survey item cooperative_effort contributed most strongly to COLLABOR and had the largest standardized factor loading (.802) as compared to consistent_rules (.737) and shared_values (.602). The $R^2$ further indicated that 64.3% of the variance in cooperative_effort was explained by COLLABOR. With regard to teachers’ perceived school support, the survey item work_recognized contributed most strongly to SUPPORT and had the largest standardized factor loading (.697) as compared to admin_behavior (.641), materials_available (.381), and special_needs (.451). The $R^2$ further indicated that 48.6% of the variance in work_recognized was explained by SUPPORT.
Tests of Model Fit Statistics

Tests of Model Fit

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Within Level

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<th>Estimate</th>
<th>Standardized Estimate</th>
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<th>z</th>
<th>$R^2$</th>
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Table 15. Two-Level CFA Results: All Latent DVs and IVs

*Significant at $\alpha = .001$. 

Continued
Table 15 continued

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Unconditional Structural Model

As the measurement of the five latent variables (*RESILI*, *INTEGR*, *COMMIT*, *COLLABOR*, *SUPPORT*) were verified, the unconditional structural model was conducted to examine the effect of the level-1 explanatory variables (x’s) on teacher motivation. However, none of the level-2 explanatory variables (w’s) were included in the unconditional structural model. In addition to the level-1 dependent latent variables (*RESILI*, *INTEGR*, *COMMIT*) and independent latent variables (*COLLABOR*, *SUPPORT*), the rest of the level-1 observed explanatory variables (*HQT*, *CLASS_AU*, *SALARY*, and *BONUS*) and covariates (*YR_EXP*, *MASTER*, and *GENDER*) were included at the within level to examine their effect on teacher motivation. Since the average
teachers’ perceived collaboration (COLLAB_b) and school support (SUPPOR_b) were also measured at the school level, they were included at the between level along with RESILI_b, INTEGR_b, and COMMIT_b. However, none of the other level-2 explanatory variables were included in the unconditional structural model.

As the factor loadings for the latent variables were constrained to be invariant across levels, random intercepts of the latent variables were estimated. Thus, the average teachers’ resilience, integrated regulation, commitment, perceived collaboration, and perceived school support at a certain school could be directly compared to another school (Bauer, 2003; Mehta & Neale, 2005). However, the large number (5) of latent variables and the large samples resulted in the numerical integration being too computationally demanding for a random coefficients model (Muthén & Muthén, 1998-2010). Therefore, random slopes used to estimate the different effect of an explanatory variable across schools were not added all at once. Instead, an ANCOVA model was first conducted, and each potential random slope of the level-1 independent variables was tested separately to determine whether or not to include that certain random slope in the unconditional structural model. The expectation maximization (EM) algorithm (Dempster, Laird, & Rubin, 1977) with the rectangular (trapezoid) numerical integration was used for this computation in Mplus 6.12.

Table 16 reports the results of the unconditional structural model. Since the factor loadings at the between level were constrained to be equal to the factor loadings at the within level, they are omitted from the results in Table 16. The results of the measurement part of the unconditional structural model revealed that the factor loadings of the survey items on the latent variables (RESILI, INTEGR, COMMIT, COLLABOR,
appeared to be fairly close to the factor loadings estimated in the two-level measurement model, because the unconditional structural model was conducted based on the verified measurement of these latent variables. Thus, the discussion in this section focuses on the results of the structural part of the model. With regard to individual teachers’ commitment at the within level, the results suggested that both $RESILI (z = 32.009; p < .001)$ and $INTEGR (z = 5.653; p < .001)$ had a positive effect on $COMMIT$, which agreed with the results of the measurement models. However, male teachers appeared to have a significantly lower commitment to their current schools or in the teaching profession ($z = -14.813; p < .001$). In addition, $SUPPORT (z = 89.644; p < .001)$ and $CLASS\_AU (z = 10.365; p < .001)$ had a significant positive effect on $RESILI$; $COLLAB\_b (z = 5.754; p < .001)$ and $SUPPORT (z = 86.042; p < .001)$ had a significant positive effect on $INTEGR$. Finally, highly qualified teachers appeared to have a slightly higher integrated regulation as compared to their non-HQT colleagues ($z = 2.423; p = .015$).

At the school level, average teachers’ commitment at a certain school ($COMMIT\_b$) was positively affected by their average resilience ($RESILI\_b$) at the school level ($z = 50.967; p < .001$), which agreed with the two-level measurement model results. In addition, $SUPPORT\_b$ had a significant positive effect on $RESILI\_b (z = 38.247; p < .001)$; $COLLAB\_b (z = 9.265; p < .001)$ and $SUPPORT\_b (z = 35.002; p < .001)$ both had a significant positive effect on $INTEGR\_b$.

None of the random slopes were statistically significant so they were not included in the unconditional structural model. Insignificant random slopes suggested that the significant effect of the level-1 explanatory variables on the dependent variables was
fairly consistent across schools. For example, individual teachers’ perceived school support was demonstrated to have a significant positive effect on their resilience ($z = 89.644; p < .001$). Insignificant random slopes indicated that this significant positive effect did not significantly vary across schools. The results are further discussed in the next section along with the school-level explanatory variables in the contextual model.
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Table 16. Unconditional Structural Model Results

*Significant at α = .001.
†p = .015.
Table 16 continued

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<td>.844</td>
<td>.156</td>
</tr>
<tr>
<td>SUPPOR(_b) on INTEGR(_b)</td>
<td>.748</td>
<td>.747</td>
<td>.021</td>
<td>35.002*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTEGR(_b) with COMMIT(_b)</td>
<td>.005</td>
<td>.302</td>
<td>.064</td>
<td>4.725*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESILI(_b) with SUPPOR(_b)</td>
<td>.013</td>
<td>.777</td>
<td>.040</td>
<td>19.196*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLLAB(_b)</td>
<td>.083</td>
<td>.774</td>
<td>.013</td>
<td>61.874*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*External Rewards*

The results of the unconditional structural model helped answer the second research question concerning the effect of external rewards on teachers’ autonomous motivation. Since external rewards are not autonomy-supportive (Ha & Sung, 2011; Pink, 2009; Ramirez, 2001; Sylvia & Hutchinson, 1985), teachers’ base salary ($SALARY$) and bonus pay ($BONUS$) were hypothesized to have an insignificant effect on their motivation. During the ML-SEM modeling process, $SALARY$ and $BONUS$ were excluded from the unconditional structural model due to the statistical insignificance of the regression coefficients. Table 17 reports the regression coefficients of the pertinent regression paths when $SALARY$ and $BONUS$ were included in the initial unconditional structural model.

The results indicated that the estimated regression coefficients of $SALARY$ and $BONUS$ were mostly not statistically significant with large $p$-values. The regression coefficients of $SALARY$ appeared to be significant at some point in the modeling process, but the
model did not converge. Thus, \textit{SALARY} and \textit{BONUS} were excluded from the unconditional structural model as well as the contextual model. The results provided evidence supporting the second hypothesis in the present study and demonstrated that external rewards did not increase teachers’ resilience, integrated regulation, or commitment to their current school or to the teaching profession.

\begin{center}
\begin{tabular}{lllll}
\hline
 & Estimate & SE & z & p \\
\hline
\textit{RESILI} on & & & & \\
\textit{SALARY} & < .001 & < .001 & 1.532 & .126 \\
\textit{BONUS} & < .001 & < .001 & -1.206 & .228 \\
\textit{INTEGR} on & & & & \\
\textit{SALARY} & < .001 & < .001 & 6.018 & < .001 \\
\textit{BONUS} & < .001 & < .001 & -.140 & .889 \\
\textit{COMMIT} on & & & & \\
\textit{SALARY} & < .001 & < .001 & 22.109 & < .001 \\
\textit{BONUS} & < .001 & < .001 & .741 & .459 \\
\hline
\end{tabular}
\end{center}

Table 17. Effect of External Rewards

Contextual Model

The contextual model was considered as the complete ML-SEM model in the present study. In addition to the level-1 explanatory variables (x’s) at the within level, the level-2 explanatory variables (w’s) were added at the between level in order to explain the between-school variability in teacher motivation. Table 18 reports the abbreviated results of the contextual model, in which the residual covariances among the survey items are omitted. The fit indices suggested a good model fit (RMSEA = .037; CFI = .925). The measurement part of the contextual model, the level-1 structural model, and the level-2 structural model are discussed respectively in this section.
## Tests of Model Fit

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Value</th>
<th>Degree of freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robust $\chi^2$</td>
<td>12855.205</td>
<td>270</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.037</td>
<td></td>
</tr>
<tr>
<td>CFI</td>
<td>0.925</td>
<td></td>
</tr>
</tbody>
</table>

### Within Level

#### RESILI by

| worthiness  | 1.000 | .746 | .005 | 151.976* | .557 | .443 |
| enthusiasm  | .950  | .569 | .005 | 107.495* | .323 | .677 |
| energy      | .682  | .466 | .006 | 78.003*  | .217 | .783 |

#### INTEGR by

| satisfied_person | .824  | .719 | .004 | 165.158* | .517 | .483 |
| satisfied_group  | .881  | .646 | .005 | 139.885* | .417 | .583 |
| like_things_run  | 1.000 | .701 | .004 | 156.826* | .492 | .508 |

#### COMMIT by

| stay_teaching | .785  | .508 | .007 | 77.884*  | .258 | .742 |
| stay_school   | 1.000 | .645 | .006 | 99.397*  | .416 | .584 |

#### COLLABOR by

| consistent_rules | 1.000 | .743 | .006 | 131.692* | .552 | .448 |
| shared_values   | .656  | .601 | .005 | 122.314* | .362 | .638 |
| cooperative_effort | .928  | .796 | .006 | 142.351* | .634 | .366 |

#### SUPPORT by

| admin_behavior  | .872  | .645 | .005 | 128.641* | .416 | .584 |
| materials_available | .567  | .388 | .006 | 65.060*  | .151 | .849 |
| work_recognized | 1.000 | .695 | .004 | 163.534* | .483 | .517 |
| special_needs   | .687  | .459 | .005 | 83.470*  | .210 | .790 |

#### COMMIT on RESILI

| .850  | .830 | .026 | 32.125* | .190 | .918 | .082 |

#### INTEGR

| .157  | .140 | .025 | 5.692*  | .266 | .429 | .571 |

#### GENDER

| -.125 | -.093 | .006 | -14.786* | .015 | .871 | .129 |

#### RESILI on SUPPORT

| .686  | .631 | .008 | 78.649*  | .044 | .140 | .2010* |

#### INTEGR on COLLABOR

| .064  | .072 | .011 | 6.721*  | .017 | .010 | .2407† |

#### RESILI with INTEGR

| .087  | .959 | .029 | 33.181*  |        |      |       |

#### COLLABOR with SUPPORT

| .239  | .696 | .007 | 106.421* |        |      |       |

#### RESILI with CLASS AU

| .044  | .140 | .007 | 20.010*  |        |      |       |

#### SUPPORT with CLASS AU

| .092  | .324 | .007 | 414.461* |        |      |       |

### Continued

Table 18. Contextual Model Results

*Significant at $\alpha = .001$.
†$p = .016$.
‡$p = .003$. 

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Table 18 continued

<table>
<thead>
<tr>
<th>Between Level</th>
<th>Estimate</th>
<th>Standardized Estimate</th>
<th>SE</th>
<th>z</th>
<th>Estimated Mean</th>
<th>$R^2$</th>
<th>Residual Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMIT_b on RESILI_b</td>
<td>1.093</td>
<td>.886</td>
<td>.017</td>
<td>50.967*</td>
<td>.093</td>
<td>.784</td>
<td>.216</td>
</tr>
<tr>
<td>RESILI_b on SUPPOR_b</td>
<td>.496</td>
<td>.748</td>
<td>.019</td>
<td>38.247*</td>
<td>.085</td>
<td>.560</td>
<td>.440</td>
</tr>
<tr>
<td>INTEGR_b on COLLAB_b</td>
<td>.159</td>
<td>.170</td>
<td>.023</td>
<td>9.265*</td>
<td>.172</td>
<td>.850</td>
<td>.150</td>
</tr>
<tr>
<td>SUPPOR_b</td>
<td>.783</td>
<td>.784</td>
<td>.021</td>
<td>35.002*</td>
<td>.172</td>
<td>.850</td>
<td>.150</td>
</tr>
<tr>
<td>TCHER_PA</td>
<td>.017</td>
<td>.025</td>
<td>.008</td>
<td>2.974‡</td>
<td>.172</td>
<td>.850</td>
<td>.150</td>
</tr>
<tr>
<td>COLLAB_b on SIZE</td>
<td>&lt; .001</td>
<td>-.246</td>
<td>.012</td>
<td>-21.221*</td>
<td>-.096</td>
<td>.060</td>
<td>.940</td>
</tr>
<tr>
<td>SUPPOR_b on PRINC_CO</td>
<td>.046</td>
<td>.045</td>
<td>.013</td>
<td>3.370‡</td>
<td>.172</td>
<td>.002</td>
<td>.998</td>
</tr>
<tr>
<td>INTEGR_b with COMMIT_b</td>
<td>.004</td>
<td>.293</td>
<td>.066</td>
<td>4.442*</td>
<td>.081</td>
<td>.796</td>
<td>.13</td>
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<tr>
<td>INTEGR_b</td>
<td>.013</td>
<td>.775</td>
<td>.042</td>
<td>18.574*</td>
<td>.081</td>
<td>.796</td>
<td>.13</td>
</tr>
<tr>
<td>COLLAB_b with SUPPOR_b</td>
<td>.081</td>
<td>.796</td>
<td>.013</td>
<td>62.817*</td>
<td>.081</td>
<td>.796</td>
<td>.13</td>
</tr>
</tbody>
</table>

Measurement

The measurement part of the contextual model for the latent variables RESILI, INTEGR, COMMIT, COLLABOR, and SUPPORT appeared to be fairly close to the results of the two-level CFA model and the unconditional structural model, which suggested that the theoretical constructs were appropriately measured and verified. All factor loadings of the survey items on their pertinent latent variables were statistically significant ($p < .001$). With the greatest standardized factor loading on each latent variable, the survey items that most strongly contributed to each theoretical construct were worthiness ($.746$) on RESILI; satisfied_person ($.719$) on INTEGR; stay_school ($.645$) on COMMIT; cooperative_effort ($.796$) on COLLABOR; and work_recognized ($.695$) on SUPPORT. The $R^2$'s further revealed that 55.7% of the variance in worthiness was
explained by RESILI; 51.7% of the variance in satisfied_person was explained by INTEGR; 41.6% of the variance in stay_school was explained by COMMIT; 63.4% of the variance in cooperative_effort was explained by COLLABOR; and 48.3% of the variance in work_recognized was explained by SUPPORT. The factor loadings at the between level were constrained to be invariant to the factor loadings at the within level. Thus, random intercepts of the latent variables were estimated; and average teachers’ resilience, integrated regulation, commitment, perceived collaboration and school support at the school level could be directly compared across schools.

Level-1 Structure

The structural model at the first level revealed the effect of teachers’ personal-level motivating factors (x’s) on their motivation. Specifically, three significant regression paths in the contextual model demonstrated the effect of these level-1 explanatory variables on teacher motivation. First, the regression equation with regard to teachers’ commitment (COMMIT) is

\[
COMMIT = .190 + .850(RESILI) + .157(INTEGR) – .125(GENDER) + r_{1ij} \]  

The regression equation indicated a significant positive effect of teachers’ resilience \((z = 32.125; p < .001)\) and integrated regulation \((z = 5.692; p < .001)\) on their commitment to their schools or remain teaching. In addition, teachers’ gender was revealed to be a significant covariate \((z = -14.786; p < .001)\). Specifically, male teachers \((GENDER = 1)\) appeared to have significantly lower commitment as compared to their female colleagues \((GENDER = 0)\).

Second, the regression equation for teachers’ resilience (RESILI) is

\[
RESILI = .266 + .686(SUPPORT) + .078(CLASS_AU) + r_{2ij} \]  

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The regression equation suggested that teachers’ perceived school support \( (z = 78.649; p < .001) \) and classroom autonomy \( (z = 10.376; p < .001) \) both had a significant positive effect on their resilience at work.

Finally, the regression equation on teachers’ integrated regulation \( (INTEGR) \) can be written as

\[
INTEGR = .015 + .064(COLLABOR) + .873(SUPPORT) + .017(HQT) + r_{3ij} \quad [8.3]
\]

The regression equation suggested that teachers’ perceived collaboration \( (COLLABOR) \) had a moderate yet significant effect that increased teachers’ integrated regulation \( (z = 6.721; p < .001) \), whereas teachers’ perceived school support \( (SUPPORT) \) had a significant positive effect on their integrated regulation \( (z = 86.660; p < .001) \). Teachers’ content competency, measured by their HQT status \( (HQT) \), appeared to have a weak yet significant positive effect on their integrated regulation \( (z = 2.407; p = .016) \). Figure 3 illustrates the level-1 structural model with the standardized solutions labeled on the significant regression paths.

On the basis of the level-1 structure, 91.8% of the within-school variance in \( COMMIT \) was accounted for by the combination of \( RESILI, INTEGR, \) and \( GENDER \); 42.9% of the within-school variance in \( RESILI \) was accounted for by the combination of \( SUPPORT \) and \( CLASS\_AU \); and 87.1% of the within-school variance in \( INTEGR \) was accounted for by the combination of \( COLLABOR, SUPPORT, \) and \( HQT \). Nonetheless, there was still a great proportion of unexplained variance (57.1%) in individual teachers’ resilience according to its residual variance.
The structural model at the second level revealed the effect of the school-level motivating factors (w’s) on teacher motivation. Specifically, five significant regression paths were found at the between level in the contextual model. First, average teachers’ commitment at the school level ($COMMIT_b$) was significantly affected by their average resilience ($RESILI_b$) at the school level, which can be written as

$$COMMIT_b = .093 + 1.093(RESILI_b) + u_{ij}$$  [9.1]

The regression coefficient of $RESILI_b$ was statistically significant ($z = 50.967; p < .001$). In accordance with the results in the two-level measurement model and the unconditional structural model, however, the effect of the average teachers’ integrated regulation at the school level ($INTEGR_b$) on their average commitment at the school level ($COMMIT_b$) was not statistically significant.
In addition, the results suggested that the average teachers’ resilience at the school level ($RESILI_b$) was significantly increased by their average perceived school support at the school level ($SUPPOR_b$). The regression equation is

$$RESILI_b = .085 + .496(SUPPOR_b) + u_{2j} \quad [9.2]$$

The regression coefficient of $SUPPOR_b$ was statistically significant ($z = 38.247; p < .001$).

The average teachers’ integration at the school level ($INTEGR_b$) appeared to be positively affected by their average perceived collaboration ($COLLAB_b$) and school support ($SUPPOR_b$) at the school level, as well as the teachers’ participation in decision making regarding school activities ($TCHER_PA$), which can be written as

$$INTEGR_b = .172 + .159(COLLAB_b) + .783(SUPPOR_b) + .017(TCHER_PA) + u_{3j} \quad [9.3]$$

Among these three level-2 explanatory variables, average teachers’ perceived school support at the school level ($SUPPOR_b$) appeared to be the most significant school factor that increased average teachers’ integrated regulation ($INTEGR_b$) according to its standardized regression coefficient (.784). This positive effect was statistically significant ($z = 35.002; p < .001$). The regression path also suggested that the average teachers’ perceived collaboration at the school level ($COLLAB_b$) increased their average integrated regulation ($INTEGR_b$), and this positive effect was also statistically significant ($z = 9.265; p < .001$). Teachers’ participation in decision making ($TCHER_PA$) was also revealed to have a significant positive effect ($z = 2.974; p = .003$) on their average integrated regulation at the school level ($INTEGR_b$).
The results further suggested that school size ($SIZE$) had a negative effect on the average teachers’ perceived collaboration at the school level ($COLLAB_b$). The regression equation is

$$COLLAB_b = -.096 - .001(SIZE) + u_{ij}$$  \[9.4\]

The regression coefficient was close to zero due to the large units in $SIZE$ as compared to the psychometric nature of $COLLAB_b$. Nonetheless, the standardized regression coefficient of $SIZE$ (-.246) indicated a negative effect of $SIZE$ on $COLLAB_b$, which was statistically significant ($z = -21.221; p < .001$).

Finally, principals’ managerial control over school activities ($PRINC_CO$) appeared to have a significant positive effect ($z = 3.370; p = .003$) on the average teachers’ perceived school support at the school level ($SUPPOR_b$), which can be written as

$$SUPPOR_b = .172 + .046(PRINC_CO) + u_{ij}$$  \[9.5\]

Figure 4 illustrates the level-2 structural model with the standardized solutions labeled on the significant regression paths.

Based on the level-2 structure in the contextual model, 78.4% of the between-school variance in $COMMIT_b$ was accounted for by $RESILI_b$; 56.0% of the between-school variance in $RESILI_b$ was accounted for by $SUPPORT_b$; 85.0% of the between-school variance in $INTEGR_b$ was accounted for by the combination of $COLLAB_b$, $SUPPOR_b$, and $TCHER_PA$; and a small proportion of the between-school variance in $COLLAB_b$ (6.0%) and $SUPPOR_b$ (.2%) was explained by $SIZE$ and $PRINC_CO$ respectively. There was still a great proportion of unexplained variance (44.0%) in the average teachers’ resilience at the school level ($RESILI_b$) according to its residual variance.
In order to accommodate the complex nature of teacher motivation within the school context, the researcher adopted the multilevel structural equation models (ML-SEM) to examine the effect of personal and school factors on teacher motivation. This section summarizes the significant results of the ML-SEM models.

First, the construct teacher motivation (TCHER_MO) was originally theorized to be measured as a second-order latent variable by three sub-constructs (first-order latent variables), including teachers’ resilience (RESILI), integrated regulation (INTEGR), and commitment (COMMIT). However, in the unilevel measurement model for teacher motivation, COMMIT appeared to be the outcome that was affected by RESILI and INTEGR. The results suggested that 87.8% of the variance in COMMIT was accounted for by the combination of RESILI and INTEGR. Therefore, a two-level measurement...
model for teacher motivation was conducted, and the structure of teachers’ resilience and integrated regulation affecting their commitment was verified at both the personal level (within) and the school level (between) with a good model fit (RMSEA = .045). However, the effect of average teachers’ integrated regulation at the school level (INTEGR_b) on their average commitment at the school level (COMMIT_b) was found insignificant ($p = .065$). The contextual model further confirmed the measurement of teacher motivation, which was portrayed by their resilience, integrated regulation, and commitment. Specifically, at the personal level, RESILI and INTEGR both had a significant effect on COMMIT; and 91.8% of the variance in COMMIT was accounted for by the combination of RESILI, INTEGR, and GENDER. Male teachers appeared to have a significantly lower commitment as compared to their female colleagues. At the school level, average teachers’ resilience at the school level (RESILI_b) alone accounted for 78.4% of the between-school variance in the average teachers’ commitment at the school level (COMMIT_b).

Second, the results of the contextual model indicated that HQT, COLLABOR, SUPPORT, and CLASS_AU significantly increased teachers’ resilience and integrated regulation in different ways, which answered the first research question concerning the effect of personal-level motivating factors on teachers’ autonomous motivation. Specifically, teachers’ resilience was significantly increased by their perceived school support (SUPPORT) and their classroom autonomy (CLASS_AU). The combination of these two explanatory variables accounted for 42.9% of the variance in individual teachers’ resilience. Teachers’ perceived school support (SUPPORT) had a significant positive effect on their integrated regulation; and their perceived collaboration
(COLLABOR) also had a moderate yet significant positive effect on their integrated regulation. In addition, teachers’ content competency, measured by their HQT status (HQT), was revealed to have a weak yet significant positive effect on their integrated regulation \( p = 0.016 \). The combination of these three personal-level motivators accounted for 87.1% of the variance in individual teachers’ integrated regulation.

Third, the results of the unconditional structural model suggested that SALARY and BONUS did not have a significant effect on individual teachers’ resilience, integrated regulation, or commitment, which answered the second research question concerning the effect of external rewards on teachers’ autonomous motivation. In order to attain an acceptable model fit, teachers’ base salary (SALARY) and bonus pay (BONUS) were excluded from the unconditional structural model due to their statistically insignificant regression coefficients. In addition, teachers’ years of experience (YR_EXP) and whether they had a master’s degree (MASTER) were also found to be insignificant on teacher motivation.

Finally, the contextual model revealed that several level-2 explanatory variables had a significant effect on teacher motivation in different ways, which answered the third and the fourth research questions concerning the effect of school-level motivating factors on teacher motivation. With regard to the between-school variability in teacher motivation, as addressed by the third research question, average teachers’ perceived school support at the school level (SUPPOR_b) were found to significantly increase their average resilience at the school level (RESILI_b), while accounting for 56.0% of the between-school variance in teachers’ resilience. In addition, average teachers’ integrated regulation at the school level (INTEGR_b) was significantly increased by their average
perceived collaboration (\textit{COLLAB}_b) and school support (\textit{SUPPOR}_b) at the school level, as well as their participation in decision making on school activities (\textit{TCHER}_PA). The combination of these three level-2 explanatory variables accounted for 85.0\% of the between-school variance in teachers’ integrated regulation. With regard to the moderating effect of school-level factors on the effect of personal-level factors, as addressed by the fourth research question, there were no random slopes detected in the unconditional structural model. Thus, the effect of personal-level factors on teacher motivation appeared to be fairly consistent across schools. Nonetheless, the regression paths in the contextual model suggested that principals’ control over school activities (\textit{PRINC}_CO) had a significant positive effect on average teachers’ perceived school support at the school level (\textit{SUPPOR}_b). School size (\textit{SIZE}) had a significant negative effect on average teachers’ perceived collaboration at the school level (\textit{COLLAB}_b). Although the effect of \textit{PRINC}_CO and \textit{SIZE} only accounted for a small proportion of the between-school variance in \textit{SUPPOR}_b (6.0\%) and \textit{COLLAB}_b (.2\%), they provided some practical insights and implications for school administrators, which are discussed in the next chapter. Professional development provided to teachers (\textit{TCHER}_PD) and the percentage of minority students (\textit{MINORITY}) were found to be insignificant school-level covariates on teacher motivation.

Based on the results from the analyses, the critical findings of this study and several practical implications are discussed in the next chapter.
Chapter 5: DISCUSSION

This chapter first summarizes the findings of the present study. The interpretation of the results and practical implications are then discussed. Finally, recommendations for future studies are offered.

Summary of Findings

This study utilized a hierarchical approach to examine personal and school effects on teacher motivation. Specifically, teachers’ autonomous motivation (intrinsic motivation and integrated regulation) was conceptualized on the basis of the self-determination theory (Deci & Ryan, 1985), and the 2007-08 Schools and Staffing Survey was analyzed through several multilevel structural equation models (ML-SEM) in order to: (1) Partition the within- and between-school variability in teacher motivation; (2) Verify the construct of teacher motivation along with teachers’ perception of collaboration and school support; (3) Examine the effect of within-school (level-1) and between-school (level-2) factors on teacher motivation. As the constructs were verified by the measurement model (confirmatory factor analysis, CFA), the unconditional structural model and the final contextual model were constructed in sequence. The results of the contextual model suggested that:

(1) Teacher motivation can be conceptualized by three distinct but correlated constructs, including teachers’ resilience, integrated regulation, and their commitment to
stay at a school or remain teaching. In addition, teachers’ commitment appeared to be significantly increased by their resilience and integrated regulation at the personal level. At the school level, overall teachers’ commitment for a certain school was positively affected by their overall resilience, but the effect of between-school integrated regulation on their overall commitment was not significant.

(2) At the personal level, analyses suggested that teachers’ classroom autonomy and perceived school support significantly increased their resilience. The findings further suggested that teachers’ perceived school support, perceived collaboration, and content competency, measured by their HQT status, significantly increased their integrated regulation. In addition, male teachers appeared to have a lower commitment to stay at their current schools or remain teaching. External rewards, such as teachers’ base salary and bonus pay, as well as teachers’ years of experience and whether they had obtained a master’s degree were revealed to be insignificant motivators on teachers’ autonomous motivation.

(3) At the school level, findings indicated that average teachers’ overall perceived support at a certain school significantly increased their overall resilience at that school and consequently led to a significantly greater overall commitment. The results further depicted that average teachers’ perceived school support at a certain school could be increased by principals’ control over school activities such as setting performance standards for students, establishing curriculum, and determining content of in-service professional development programs for teachers. In addition, average teachers’ perceived school support, collaboration, and their participation in decision making on school activities had a significant positive effect on their overall integrated regulation at that
certain school. However, results indicated that a larger-sized school (in terms of student enrollment) caused lower overall collaboration perceived by the teachers at that school. In addition, professional development provided for teachers and the percentage of minority students were revealed to have an insignificant effect on teachers’ motivation at the school level.

Conclusions

Because the majority of teachers enter the teaching profession with a great passion and enthusiasm to serve students and bring social equity, schools need to cultivate a healthy environment to help them stay autonomously motivated. On the basis of Deci and Ryan’s (1985) self-determination theory (SDT), this study’s findings revealed personal- and school-level factors that can satisfy teachers’ inner needs and subsequently increase their autonomous motivation. Policymakers and school administrators should utilize these motivators to assist teachers to stay motivated. For example, as the policymakers develop the new state teacher evaluation system, they should discover a way to mindfully communicate and recognize teachers’ efforts in order to promote a feeling of support rather than judgment. Likewise, principals should also be mindful when they make daily decisions to foster a school environment that supports teachers’ autonomy, belonging, and competency.

Resilience, Integration, and Commitment

On the basis of the results of the confirmatory factor analysis (CFA), components pertinent to the theoretical construct of teacher motivation were verified. Specifically, individual teachers’ resilience and integrated regulation both significantly increased their commitment to stay in their current schools or to the teaching profession. At the school
level, overall teachers’ resilience at a certain school was revealed to have a significant positive effect on the overall commitment of the teaching staff at that particular school. The results of this measurement model had at least three implications.

First, teachers’ autonomous motivation should be considered as multifaceted but cannot be reduced to a single dimension. In this study, teacher motivation was initially conceptualized as a second-order latent variable which encompassed three sub-constructs including teachers’ resilience, integrated regulation, and commitment. However, the results suggested a more complex and intertwined relationship among the three rather than the over-simplified structure as proposed. In other words, it is not reasonable to presume that teachers’ autonomous motivation can be depicted merely by their resilience, integrated regulation, and commitment. Instead, teachers’ resilience and integration appeared to increase their commitment at the personal level, whereas overall commitment of the teaching staff at a certain school appeared to be the result of overall teachers’ resilience at the school level. The results resonated with the existing literature on teacher motivation that suggests teacher motivation is fairly complex and nonlinear (Bishay, 1996; Eren & Tezel, 2010; Morcom & MacCallum, 2010; Roness, 2011; Schondeld, 1990; Schutz, Crowder, & White, 2001; Skaalvik & Skaalvik, 2011). Various factors and dimensions should be taken into consideration in order to quantify and examine in-service teachers’ motivation. Consequently, more sophisticated structural models should be adopted in order to thoroughly account for the various dimensions of teacher motivation.

Second, at the personal level, the results suggested that individual teachers’ resilience and integrated regulation significantly increased their commitment to stay at
their current schools and to the teaching profession. The results expanded the existing literature with regard to in-service teachers’ retention and attrition (Ingersoll, 2008; Roness, 2011; Schondeld, 1990; Skaalvik & Skaalvik, 2011). For instance, the results of the present study aligned with Skaalvik and Skaalvik’s (2011) study, which demonstrated that teachers’ motivation to leave the teaching profession are positively correlated with their emotional exhaustion and negatively correlated with their job satisfaction. School administrators should cultivate a working environment that fosters teachers’ resilience and integrated regulation in order to help them commit to teaching and their schools. The present study’s findings also aligned with existing literature that describes principals as transformational leaders (Eyal & Roth, 2011; Finnigan, 2010; Leithwood, Menzies, Jantzi, & Leithwood, 1999) and suggested that principals should clearly communicate a school’s vision and mission to help teachers integrate these with their own beliefs and values, subsequently developing greater commitment to their school and the teaching profession.

Third, at the school level, the average commitment of teaching staff at a certain school was a significant result of their overall resilience at the school level, which shed some light on how to keep motivated teachers in the profession because they are valuable assets to the school (Johnson, 2011). The average resilience of teaching staff at a school caused a significantly greater commitment that enabled teachers at that school to feel more willing to stay in their current teaching position and in the teaching profession compared to other schools. Thus, principals should cultivate a working environment that enhances teachers’ resilience and reduces their experience of emotional exhaustion or burnout. Even though the integrated regulation of overall teaching staff at a certain school appeared to have an insignificant effect on between-school commitment, principals
should communicate the school’s vision to their teaching staff for other benefits suggested by existing literature, such as teachers’ emotional status and well-being (Eyal & Roth, 2011; Skaalvik & Skaalvik, 2011).

**School Support**

The results suggested teachers’ perceived school support was a salient factor that increased their autonomous motivation. At the personal level, individual teachers’ perceived school support was found to have a significant positive effect on both their resilience and integrated regulation. In other words, as a teacher perceives that he or she is afforded support by the school, such as encouragement from school administration, materials provided for daily work, recognition for a job well done, and specific resources and training needed to serve students with special needs, a teacher tends to possess higher resilience at work to deal with work-related stress and emotional fatigue as well as higher integrated regulation to embrace the school’s visions and values. As discussed in the preceding section, both individual teachers’ resilience and integrated regulation resulted in higher commitment to stay in their current school or continue teaching. The results aligned with several existing studies focusing on teachers’ perception of school support and their motivation (Johnson, 2011; Smith & Ingersoll, 2004; Weiss, 1999) and reinforced that principals should continue to foster a working environment that is supportive and encouraging. In this way, teachers can be more resilient against job-related stress and more integrated with the school’s visions and values.

In addition, findings revealed that the average teachers’ perceived school support appeared to be a significant factor to increase overall teachers’ resilience and integrated regulation at the school level. In other words, when the teaching staff at a certain school
perceives greater support from that certain school, as compared to other schools, their overall resilience and integrated regulation are significantly higher than teachers from other schools. Thus, while supporting and encouraging individual teachers, a principal should clearly communicate to the teaching staff how to access administrative support. The present study found that principals’ control over school activities had a significant positive effect on average teachers’ overall perceived school support (Fernet, Senécal, Guay, Marsh, & Dowson, 2008) and further demonstrated this direct effect on teachers’ perceived school support and subsequently on their resilience and integrated regulation. In reviewing the 2007-08 Principal Questionnaire, school activities that principals may control include setting students’ performance standards, establishing curriculum, determining content of professional development, evaluating teachers, hiring new teachers, setting the discipline policy, and budgeting. Principals should utilize opportunities when they are overseeing or making decisions on these daily tasks to provide greater support to his or her teaching staff. Principals’ daily managerial decisions have a significant positive effect on average teachers’ overall perceived school support and subsequently affect their resilience and ultimately their commitment to stay at that school or in teaching. For this reason, principals must assume responsibility for daily decisions about school activities deliberately and mindfully, such that they can foster an autonomy-supportive teaching environment to promote teacher motivation.

Collaboration

From this study, teachers’ perceived collaboration had a significant positive effect on their integrated regulation not only at the personal level but also at the school level. Measurement of teachers’ perceived collaboration emphasized their perception of how
teachers collaboratively enforce the rules for student behavior, how they share each other’s beliefs and values on school missions, and the amount of cooperative efforts displayed among teachers. The results suggested that individual teachers’ perceived collaboration, even though not as strong as their perceived school support, had a significant positive effect on their integrated regulation. The results aligned with existing literature on teacher collaboration that reinforces teachers’ psychological needs for relatedness among themselves (Dzubay, 2001) and suggest that opportunities to work with other teachers who share the same beliefs and the psychological satisfaction of relatedness may also help them relate to the school visions. The positive effect of teachers’ perceived collaboration also agrees with the positive correlation between teacher collaboration and their intrinsic motivation as demonstrated in the existing literature (Hildebrandt & Eom, 2011; Kocabaş, 2009; Schondeld, 1990; Skaalvik & Skaalvik, 2011). For this reason, principals should create a collaborative environment at their schools for teachers to work together and share their experiences with each other, such that their need for relatedness may be satisfied and they can share a common goal and vision.

At the school level, the present study found that average teachers’ overall perceived collaboration also had a positive effect on their overall integrated regulation at that certain school. In other words, when most of the teachers believe that there is a great amount of collaboration at their school, the staff members’ integration of the school visions and values at that certain school is significantly greater than other schools. To this end, principals should create a collaborative, inclusive environment that offers everyone at that school an opportunity to work with one another and exchange their experiences.
and beliefs. This inclusive and collaborative environment can enable staff members to integrate the school’s visions and share common visions and values, which eventually promote their satisfaction and autonomous motivation. However, this task may be more challenging for principals at larger-sized schools. The results of the present study suggested that teachers at schools with larger enrollments may have significantly lower perceived collaboration at the school level. The results addressed a practical challenge for principals at larger-sized schools to overcome in creating collaborative environments despite school size.

**Teacher Control and Autonomy**

The present study demonstrated that teachers’ professional autonomy is a salient factor affecting their autonomous motivation. At the personal level, the results suggest that individual teachers’ classroom autonomy had a significant positive effect on their resilience. In other words, when individual teachers have more control over their lesson plans, instructional materials, teaching techniques, and grading policies, they tend to have higher resilience and less experience of emotional exhaustion. The results align with the existing literature on teachers’ professional autonomy (Hargreaves, 2003; Hyslop-Margison & Sears, 2010) and suggest that as individual teachers are granted such responsibility to be the owner of their classrooms, their need for autonomy can be satisfied. As teachers accept that they are responsible for their students’ learning and academic achievement, they demonstrate increased resilience at work and subsequently commit to their schools or to the teaching profession.

At the school level, the present study revealed that teachers’ overall participation in making decisions had a positive effect on the integrated regulation of teaching staff at
that school. The results affirm existing literature that describes a principal as a transformational leader who inspires and motivates teachers by articulating a clear and justified vision (Avolio, Bass, & Jung, 1999; Eyal & Roth, 2011) and by developing a shared vision that promotes teachers’ trust and respect (Leithwood, Tomlinson, & Genge, 1996). This study’s evidence reinforces the notion that principals should practice their transformational leadership to distribute a shared leadership and empower teachers to make decisions (Green, 2010) in order to create an autonomy-supportive school environment (Gagne & Deci, 2005; Sheldon, Turban, Brown, Barrick, & Judge, 2003). For this reason, to increase teachers’ integration and autonomous motivation, principals should allow teachers to participate in decision making and have more influence over school activities, such as setting performance standards for students, establishing curriculum, or determining the content of in-service professional development programs.

**Content Competency**

Teachers’ content competency, as measured by their highly qualified teacher (HQT) status, had a significant positive effect on their integrated regulation. Even though the effect was considerably weak as compared to other personal-level factor such as teachers’ perceived school support and collaboration, the existence of such moderate influence of teachers’ HQT status on their integration and subsequently on their commitment provides some practical implications for principals. The results suggest that highly qualified teachers, who presumably have greater content competency, tend to integrate the school’s vision and values better than their non-HQT colleagues. Consequently, principals should encourage teachers to continue learning and advancing their content knowledge. Meanwhile, teachers should also be placed in appropriate
teaching assignments, where they can demonstrate teaching competency in the subject area(s). This implication aligns with Roness’ (2011) conclusion about Norwegian teachers’ motivation, asserting that “by building a professional teacher identity, by focusing on subject matter, and by emphasizing intrinsic motivators, perhaps the profession can succeed in encouraging teachers to stay” (p. 636). Insofar as teachers’ HQT status was found to be one of the three motivators that increases their integrated regulation, along with perceived school support and collaboration, the implication echoes Cagle and Hopkins’ (2009) suggestions to principals to provide highly qualified teachers a supportive school environment to promote their self-efficacy. In this way, teachers can be both competent and motivated.

*External Rewards*

The results of this study confirmed existing scholarship focusing on teachers’ intrinsic motivation (Ariely, Gneezy, Loewenstein, & Mazar, 2009; Brookhart & Freeman, 1992; Lortie, 1975; Pink, 2009; Schutz, Crowder, & White, 2001; Spear, Gould, & Lee, 2000; Watt & Richardson, 2007) and found that external rewards did not have a significant effect on teachers’ autonomous motivation. Although this study did not examine a particular incentive pay policy, its results support findings from recent studies that argue against the effectiveness of an incentive pay policy on teacher quality or motivation (Frohreich, 1988; Ha & Sung, 2011; Murnane & Cohen, 1986; Ramirez, 2001; Sylvia & Hutchinson, 1985). Compared to several factors that are likely to satisfy teachers’ inner needs, such as feeling supported by the school administration, collaborating with other teachers, and practicing their professional autonomy in daily work, the effect of external rewards on teachers’ self-determined motivation appears to
be insignificant. In other words, the present study does not provide any direct evidence to discredit any specific incentive pay policy, but the results demonstrate that teachers were significantly more motivated by autonomy-supportive motivators. There are numerous benefits of an autonomously motivated teacher: (1) promoting students’ autonomous motivation to be involved in learning (Gokce, 2010; Lovat, Toomey, Clement, Crotty, & Nielsen, 2009; Morcom & MacCallum, 2010; Pelletier, Seguin-Levesque, & Legault, 2002; Wood, 2001); (2) accelerating student academic success to attain higher standards (Bandura, 1993; Gokce, 2010; Urdan & Turner, 2005; Zimmerman, 2000); and (3) promoting teachers’ personal professionalization (Dzubay, 2001; Ingersoll, Alsalam, Quinn, & Bobbitt, 1997) and well-being (Eyal & Roth, 2011; Feldmann, 2011; Grenville-Cleave & Boniwell, 2012; Hargreaves, 2003; Skaalvik & Skaalvik, 2011). Accordingly, policymakers and principals should utilize the autonomy-supportive motivators, as opposed to external incentives, as a prioritized strategy to motivate in-service teachers and to promote the commitment of talented and dedicated teachers.

Recommendations

In the following section, limitations and recommendations are discussed for future studies. First, even though the 2007-08 Schools and Staffing Survey used in the present study provides systematically collected and reliable data available to make generalizable results (Coopersmith & Gruber, 2009; Tourkin, et al., 2010), the pre-existing dataset may have limited the possibility of discovering significant effects of potential personal or school factors on teacher motivation. For instance, at the personal level, teachers’ content competency was measured by their HQT status and found to have a significant positive yet weak effect on their integrated regulation. However, due to the pre-designed survey
items in the 2007-08 Teacher Questionnaire, teachers’ self-reported content competency or efficacy were not measured or included in the multilevel structural models. In addition, professional development opportunities provided for teachers do not appear to be a significant level-2 factor affecting teacher motivation at the school level. The results seemed to contradict existing research (Kardash, 2000; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). However, in reviewing the 2007-08 Principal Questionnaire, the survey items related to teacher professional development addressed the amount (time) of professional development designed for teachers rather than the actual content and quality of these professional development events, which might be one potential reason of the non-significance of teachers’ professional development in relation to teacher motivation. Similarly, because SASS survey items are perception data, principals’ perception of school environment may potentially be biased. Although literature has suggested that respondents can often accurately report their social environment (Alper, Tjosvold, & Law, 1998), principals’ perception of their own control over school activities, teachers’ participation in decision making, and professional development opportunities provided for teachers could have been measured more accurately by other objective or standard-based instruments. To this end, other instruments may be utilized and incorporated with the existing SASS survey data to measure each potential personal- and school-level factor more accurately and further examine its effect on teacher motivation.

Second, the sampling and data collection strategy of the 2007-08 SASS administration might potentially cause statistical biases in the multilevel models applied in the present study. For instance, the 2007-08 SASS teacher sampling design attempted a self-weighting design to minimize the variance of teacher estimates within the school
stratum (Tourkin, et al., 2010). However, the sampling design may potentially result in low reliability for each of the sampled schools. The reliability of the estimates of level-1 coefficients for each of the $j$ groups in a hierarchical design can be written as

$$ \text{Reliability} = \frac{\tau_{qq}}{\tau_{qq} + (\sigma^2/n_j)} \text{ for each } q = 0, 1 \ldots Q \tag{10} $$

where $n_j$ is the number of observations from the $j^{th}$ group, and $Q$ is the number of the explanatory variables at the first level. The formula suggests that more observations from a group ($n_j$) produce higher reliability of the estimates. Insofar as the 2007-08 SASS administration limited teacher samples to a minimum of 1 and a maximum of 20 teachers sampled at each sampled school, the small number of sampled teachers per school ($n_j$) may potentially decrease the reliability of estimates for each of the sampled schools.

Snijders and Bosker (1999) suggested that group sizes that are in the range from 2 to 50 (or 100) are considered to be relatively small. Consequently, the sample data with small sizes from each group did not provide too much information, and there may be a tendency of overfitting the ANCOVA model due to large standard errors of many parameters. In the case of future studies that analyze the national dataset by multilevel models, simulations should be utilized to examine the quality of the estimates of parameters. Other statistical strategies or estimation procedures should also be conducted and compared to discover the most accurate method to accommodate the stratified multilevel samples.

Third, there may be other significant motivating factors that were not measured by the 2007-08 SASS survey items. The results of the contextual model suggest that there is still a considerably great unexplained variability existing in teachers’ within- and between-school resilience, integrated regulation, and commitment, which provided
evidence indicating that other predicting factors at the personal or school level were not captured or included in the models. For future studies, other potential personal- and school-level motivating factors should be examined in order to provide a more complete picture of teacher motivation and motivating factors within the school context.
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