

School principals' systems thinking: Antecedents and consequences

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Introduction

A school is an inherently complex organization, involving a vast number of interacting functions, people, and purposes (Crick *et al.*, 2017). Practitioners and researchers alike agree that recent years have brought even more challenging intricacies to school leadership (Fullan, 2014; Saiti, 2015). Therefore, current principals facing today's educational complexities may benefit from the holistic perspective of systems thinking (ST), which emphasizes understanding the system as a whole before studying its parts, while simultaneously considering an array of influencing factors (Shaked and Schechter, 2017). Research showed that principals' ST (PST) may yield a number of positive effects including improved school and teacher outcomes (Pang and Pisapia, 2012). Yet, ST has been hardly studied in the educational leadership field in relation to faculty members' job attitudes (Bui and Baruch, 2012).

Over the past several decades, the single-leader model has been progressively eroding as the requirements of the job have come to exceed the capacity of a single individual (Day, Gu and Sammons, 2016). Principals have increasingly come to rely for support on school middle-leaders such as department heads, grade-level coordinators, and subject coordinators (Bush and Glover, 2014). Middle-leaders constitute the "intermediate layer" in the school's organizational structure, located between the senior leadership and the classroom teachers (Gurr and Drysdale, 2013). Specifically, scholars have shown that subject coordinators are critical to a school's successful functioning in complex situations (Day *et al.*, 2016). Researchers found that the subject coordinator role had a significant influence on school performance and student results

(Leithwood, 2016). Operating in an environment of constant and extensive external demands and reforms, subject coordinators are the motivating force driving for change. Among other important roles, they coordinate teachers' pedagogical tasks, thereby contributing toward academic improvement (Somech and Naamneh, 2017). Research indicates that one fundamental factor that may have a substantial impact on subject coordinators' attitudes toward their work and workplace is the principal's leadership (Bush and Glover, 2014). Accordingly, this study aimed to investigate the consequences of PST on their subject coordinators' job attitudes.

According to Shaked, Benoliel, Nadav and Schechter (2018) conceptualization, PST includes four major competencies through which principals apply ST in their schools - (1) *Evaluating significance* refers to the principal's ability to envision elements of school life according to their significance for the entire system. (2) *Openness to a variety of opinions* refers to the principal's willingness to listen to diverse people and ideas, which derives from the principal's self-awareness of his/her own limitations and readiness to learn from others. (3) *Leading wholes* refers to principal's holistic perspective, oriented toward seeing the big picture and not only its individual parts. (4) *Adopting a multidimensional view* refers to the principal's contemplation of several aspects of a given issue simultaneously, by attributing that issue's emergence and existence to a wide range of potential sources. Their conceptualization of ST draws upon Bertalanffy's (1968) claim that the only way to fully understand why a phenomenon arises and persists is to understand its parts in relation to the whole. This approach reflects the open system approach: Every phenomenon must be viewed from the perspective of the whole system to which it belongs as well as its subsystems and the relationships between its various components (Hammond, 2005).

Following Shaked et al. (2018) conceptualization of PST, the present study proposed to investigate the antecedents and consequences of PST as perceived by their subject coordinators.

Specifically, the study model posited that PST activities would mediate the relationships between principals' instructional leadership (IL) and subject coordinators' organizational commitment and job satisfaction (Please see Figure 1). Such investigation is important because organizational commitment and job satisfaction are related to school effectiveness and a positive and healthy school work environment (Bogler and Nir, 2015; Skaalvik and Skaalvik, 2017). IL was selected as an antecedent of PST because it involves not only a wide range of activities aiming at improving teaching and learning and garnering schoolwide commitment (Hallinger and Wang, 2015) but also due to its relevance to subject coordinators' core pedagogical and administrative functions in the school operation. Yet, studies have investigated IL and ST leadership models separately; few, if any, have inquired whether principals' IL behavior may be a predictor of PST as perceived by subject coordinators.

Although some scholarly attention has been given to advancing research on school leadership and ST, several gaps remain in the literature. First, despite the educational field's growing complexities and climate of outcome-based accountability, which call for systemic perspectives in managing schools (Kruse, 2018), existing research on PST remains limited (Shaked and Schechter, 2017). Second, research has indicated that individual competence and leadership are antecedents to ST and additionally that ST tends to positively influence job outcomes and behaviors (Bui and Baruch, 2010, 2012), calling for exploration of such antecedents and outcomes for PST tendencies in school leadership. Third, despite the increasing importance of the contribution of subject coordinators' role (Leithwood, 2016; Somech and Naamneh, 2017), no studies have examined the role of PST activities in enhancing subject coordinators' job attitudes. The goal of the present study, then, is to address these important yet relatively unstudied issues by exploring a model that investigates the antecedents and consequences of PST as perceived by subject coordinators.

-Insert Figure 1 about here-

Theoretical Background and Hypotheses

School principals as system thinkers: Antecedents and consequences

According to the ST framework, organizations are complex systems composed of interconnected parts studied as an evolving whole, with emergence and interdependencies as major concepts (Bousquet and Curtis, 2011). ST does not try to break systems down into parts in order to understand them but rather concentrates on how the parts function together in networks of interaction (Senge, 2006). Hence, ST searches for explanations, clarifications, perspectives, notions, assumptions, and conclusions – differently from those produced by traditional scientific management frameworks. This approach generates more occasions to learn and inquire about the network's complexities and details, and to study the arrangements and interactions among subsystems (Stacey, Griffin and Shaw, 2000). Yet, none of these are understandable without contextualization (Dale and Newman, 2005). A system as a whole coexists in relation to an environment; its functioning is maintained by managing a continuous flow of resources from its environment (Hoy and Miskel, 2013; Leithwood, Sun and Pollock, 2017). Flows of resources ensue through the organization's interrelated parts via feedback loops (circular cause-effect relations underlying the changes that occur over time in a system's behavior), with the main goal of securing improvement by adapting the system to align with the required change (Gharajedaghi, 2011).

Management scholars have increasingly recognized that schools are becoming more open systems, exposed to external influences interacting with other external systems such as economic, political, and global systems, through which they secure new properties and resources (Brezicha, Bergmark and Mitra, 2015). Within the context of school improvement,

principal leadership activities are aimed to keep the school system in a steady-state through leadership activities both within the school and between the school and its environment (Benoiel, 2018; Tejada and Ferreira, 2014). PST as a leadership strategy may thus be most appropriated, enhancing individual and school outcomes because school functioning is highly dependent upon both staff's job attitudes and stakeholders' actions, especially when resolving complex matters (Crick *et al.*, 2017; Leithwood *et al.*, 2017). In this regard, several researchers have demonstrated how managers' application of ST assisted them to enhance workers' job attitudes and cope successfully with complex situations. For example, by improving school administrators' understanding of the impact of each decision on the organization, ST was found to enable school administrators to make better decisions that tended to improve student achievement (Marshall and Fisher, 2018; Thornton, Peltier, and Perreault, 2004). ST was also found to provide effective means to address the challenges of teacher retention (Minarik, Thornton, and Perreault, 2003).

In the context of the U.S. No Child Left Behind federal legislation, ST was proposed as a useful tool to help educational leaders see public relations as a continual, systematic process that is essential for engaging the school community's support to improve students' learning and faculty's job attitudes (Chance, 2005). Dyehouse and her colleagues (2009), argued that ST can provide a framework for representing many of the components in a complex curricular program, thus serving as a more precise and explicit method of interpreting and assessing program results than existing methods. Similarly, Wells and Keane (2008) demonstrated how ST may be implemented to develop professional learning communities in schools. One rare quantitative study on ST effectiveness (Pang and Pisapia, 2012) identified Hong Kong school principals' holistic ST-based leadership approach as the strongest predictor of school leaders' effectiveness, teachers' trust and commitment to school vision, distinguishing between more effective and less effective leaders.

More recently, Shaked et al., (2018) identified four characteristics of PST, through which effective principals apply the ST approach in their schools, as discussed above: (1) *Evaluating significance* (2) *Openness to a variety of opinions* (3) *Leading wholes* (4) *Adopting a multidimensional view*. Considering that PST helps principals see the deeper patterns underlying actions and details, the study proposes that such competencies may enable principals to identify actions to facilitate job attitudes of subject coordinators. Subject coordinators' important role in fostering their schools' gains in pedagogical practices and academic outcomes has been recognized in educational research from many countries around the world (Carter, 2016; Ng and Chan, 2014; Somech and Naamneh, 2017), especially within educational contexts highly focused on measurable student achievements (Hunt, 2013). Research showed that improvements in subject coordinators' job attitudes largely reflect the relationship with their principals, as well as principals' application of ST assists in enhancing faculty members' job attitudes (Gurr and Drysdale, 2013). Therefore, the goal of this study was to investigate the antecedents and consequences of PST as perceived by their subject coordinators.

Principals' instructional leadership as an antecedent of principals' systems thinking

The most frequently used conceptualization of IL (Hallinger, 2011) outlines three dimensions of IL: (1) defining the school's mission; (2) managing, monitoring, and developing the school's instructional program; and (3) developing a positive school learning climate. Research shows that instructional leaders pay particular attention to the main goal of schooling, thus coordinating the school academic program (Neumerski, 2012). IL helps managers to focus not only on the 'trees' (i.e., particular situations, limited domains) but also on the 'forest' – an overall view. Such a focus may facilitate PST which presupposes that most thinking, experiencing, practices, and institutions are interconnected (Chen, 2011). Also, instructional leaders consider the interplay between actions and responses according to a set of purposes

(Hallinger, 2011). This emphasis on the interrelatedness of goals may be related to a PST approach because it necessitates reviewing the system to identify its interconnections and then forming solutions based on this deeper understanding (Wells and Keane, 2008).

Moreover, as pointed by Fullan (2014), principals' ability to think systemically depends on their capacity to think strategically. Strategic thinking requires competent planning, anticipation, and an understanding of actions' interdependency within a social system, implying focused coordination of resources. Instructional leaders are skilled at thinking strategically (Robinson, Hohepa and Lloyd, 2009). IL necessitates leaders to synthesize a wealth of information before making decisions and establishing courses of action that promote improvement (Brazer and Bauer, 2013). Indeed, IL involves successful exploitation of data acquired both from internal and external resources for instructional decision-making (Osborne-Lampkin and Cohen-Vogel, 2014). Such skills may be related to PST competencies which focuses on how the parts of a system operate in intimate interconnections, by understanding parts' interactions that create the whole and that shape its defining characteristics (Gharajedaghi, 2011).

Furthermore, PST can be built only by understanding the 'structures' that underlie complex situations and by visualizing profound changes (Bui and Baruch, 2010). IL involves development of school-based learning communities that provides meaningful staff development, where educators collaborate to innovate teaching pedagogies and to improve students' academic achievement (Hallinger, Wang and Chen, 2013). IL practices sustain a school vision that establishes clear learning goals and garners schoolwide commitment to these goals, leading principals to focus on the system as a whole as well as on the interrelations among the system's components (Rigby, 2014; Stronge, Richard, and Catano, 2008). Hence,

Hypothesis 1: There is a positive relationship between principals' IL and PST.

Subject coordinators' job satisfaction and organizational commitment as outcomes of principals' systems thinking

In investigating subject coordinators' job attitudes we have focused on job satisfaction and organizational commitment. According to the study model, PST is positively related to subject coordinators' outcomes of job satisfaction and organizational commitment.

Job satisfaction

Job satisfaction, the most intensively covered attitude in the organizational psychology literature (Judge and Kammeyer-Mueller, 2012), has been defined in various complementary ways that implicitly contain both affects (feelings) and cognitions (evaluations, beliefs). Thus, job satisfaction represents the individual's mental state in relation to his or her work or work environment, resulting from positive or negative appraisal of his or her job or job experiences (Robbins and Judge, 2016). Job satisfaction has been suggested to be related to perceived fulfillment of one's needs through work (Kreis and Brockopp, 1986) and of one's job-related needs at work for teachers in schools (Hsieh, 2016).

Theoretically, PST could enhance job satisfaction through motivational mechanisms. Previous research has identified working conditions and the principal leadership activities as factors enhancing teachers' job satisfaction (Bogler and Nir, 2015; Skaalvik and Skaalvik, 2017). Principals who engage in ST activities seek to understand the full picture by listening to other points of view and are thus willing to listen to others and learn from others (Wells and Keane, 2008). Thus, principals engage in dialogue with those holding educational perceptions, such as subject coordinators, that may differ from their own (Shaked et al., 2018). This dialogue enables principals to analyze school functioning and to design alternative systems and solutions by exploring how people and elements in the school environment interact (Bousquet and Curtis,

2011). PST may therefore provide the conditions for intrinsic motivation, offering subject coordinators appropriate support, thereby enhancing job satisfaction (Cheng, 2011).

Furthermore, by encouraging a more cooperative approach between leaders and staff, PST gives subject coordinators more responsibility for school improvement based on a deeper understanding of the school system (Wells and Keane, 2008). Thus, by consulting with subject coordinators to ask for their ideas and recommendations in order to generate new knowledge, PST enables interactions between school faculty members, allowing information exchange and knowledge exploration (Price-Mitchell, 2009; Schechter and Qadach, 2012). As such, subject coordinators may feel more pride and satisfaction arising from more challenging, growth-enhancing opportunities (Dou, Devos and Valcke, 2017).

***Hypothesis 2a.** There is a positive relationship between PST and subject coordinators' job satisfaction.*

Organizational commitment

Organizational commitment was defined by Mowday, Steers and Porter (1979), as "the relative strength of an individual's identification with and involvement in a particular organization" (p. 226). Reflecting individuals' evaluation of organizations' work conditions (Joo, Yoon and Jeung, 2012), organizational commitment comprises three factors: *identification* – acceptance of the organization's goals and values, *involvement* – willingness to invest effort on the organization's behalf, and *loyalty* – the importance attached to keeping up membership in the organization (Bogler and Somech, 2004). Several studies indicated that subject coordinators' organizational commitment can be an important predictor of their performance since it is positively related to their dedication to attain school goals (Bogler and Nir, 2015; Park, 2005).

Research has indicated that teachers perceive higher organizational commitment when their principal demonstrates high levels of consideration and supportive behavior (Meyer,

2016; Northouse, 2016). Similarly, positive teacher-principal interactions were central components found to explain organizational commitment (Bogler and Nir, 2015). PST is characterized by striving for the whole school's success, not just one's personal success (Bui and Baruch, 2010). In this sense, previous research reported that more frequent actions taken to accomplish school goals, such as considering elements of school life according to their significance for the entire system, ensure teaching staff's identification with the school's aspirations and values (Pang and Pisapia, 2012; Shaked and Schechter, 2017). This in turn may predispose subject coordinators to demonstrate greater commitment to the school system (Joo and Park, 2010; Meyer, 2016). Hence,

***Hypothesis 2b.** There is a positive relationship between PST and subject coordinators' organizational commitment.*

Mediation model

Based on the reviewed theoretical perspectives, we proposed that PST would mediate the relationships between IL and subject coordinators' job satisfaction and organizational commitment. The proposed hypothesized model coincided with Bui and Baruch's call (2010, 2012) for analyzing antecedents and outcomes of the five disciplines depicted in Senge's (2006) *Learning Organization* framework, namely personal mastery, team learning, mental model, shared vision, and ST. In this framework, ST is the linchpin of the learning organization, integrating all disciplines, fusing them into a coherent body of theory and practice. Accordingly, we focused on ST and proposed that ST thus plays the role of mediator, facilitating the influence of antecedents and integrating their effects toward the desired outcomes. Hence, this study postulates an integrative model: IL functions to enhance subject coordinators' job satisfaction and organizational commitment through the mechanism of PST. Therefore, we posit that PST serves as a vehicle whereby IL enhances subject coordinators' job satisfaction and organizational commitment.

Hypothesis 3: PST mediates the relationships of principal IL to (a) subject coordinators' job satisfaction and (b) subject coordinators' organizational commitment.

Method

Participants and procedure

Data collection was performed in several steps. After the research project was approved by the Ministry of Education, schools were randomly selected from a list of elementary schools provided by the Ministry of Education. We first contacted the principal, explained the study's purpose, and emphasized the importance of candid answers. To avoid the issue of school membership interdependence, data was collected from a sample of 226 subject coordinators from 226 elementary schools randomly chosen in Israel. Only subject coordinators that belonged to the school management team (SMT) were chosen to participate in the present study. SMTs typically consist of senior personnel such as the principal, deputy principals, and other key school officials. The SMTs main duties involve managerial and pedagogical responsibilities (Abbott and Bush, 2013) and principals typically serve as the leaders of SMTs (Thorpe and Bennett-Powell, 2014).

The core purpose of the subject coordinator in Israel is to provide professional leadership and management for a specific subject (e.g., literacy, math, sciences) to ensure high quality instruction and improved achievement for all students. Among other responsibilities, a subject coordinator supports, guides, and motivates teachers of the subject, evaluates the effectiveness of teaching, and determines future priorities and targets for the subject. Therefore, the major task of a subject coordinator is similar to the common descriptions of their duties in the U.S. and European countries (Bennett *et al.*, 2007).

Subject coordinators participated voluntarily through survey questionnaires; they completed questionnaires on their principals' ST competencies, their principals' IL, job satisfaction and organizational commitment. Although our data may be vulnerable to the

inflation of correlations by common method variance due to the use of a common source, we reasoned that subject coordinators would be better able to assess their own attitudes than independent parties. Moreover, caution was taken to minimize the impact of potential common method bias as suggested by Podsakoff et al. (Podsakoff, MacKenzie, Lee, and Podsakoff, 2003). We guaranteed our participants anonymity and response confidentiality. Both principals and subject coordinators provided some demographic information.

School size was based on the number of enrolled students with an average mean of 407.81 students ($SD = 163.02$) per school. Distribution of the school size ranged between 35 and 750 enrolled students, with a median 400, skewness $-.025$ and kurtosis $-.672$ indicating a normal distribution (Curran, West and Finch, 1996). Subject coordinators (62% women) had a mean age of 39.06 years ($SD = 7.34$) and mean job tenure in the profession of 12.29 years ($SD = 7.52$), with 70.4% holding a bachelor's degree and 28.3% holding a master's degree. The principals (66% women) had a mean tenure in the present school of 8.84 years ($SD = 6.06$) and at least a bachelor's degree (15.6%), with 74.4% holding a master's degree and 5% holding a doctorate.

Measures

Principals' instructional leadership. To assess the frequency at which a principal displayed IL behaviors, the 31-item abbreviated version of the Principal Instructional Management Rating Scale, which was originally developed by Hallinger and Murphy (1985), and slightly adapted to the Israeli context and elementary school level was used. This version has demonstrated adequate reliability and validity estimates (Schechter and Qadach, 2016). The CFA indicated acceptable goodness-of-fit indexes, $\chi^2(62) = 170.07$, CFI = .903, IFI = .904, RMSEA = .081.

Based on CFA, IL involves three dimensions: (a) *Defining the school's mission* (e.g., 'Defines the responsibilities of the team in achieving the school's educational goals'), (b)

Managing the instructional program (e.g., 'Clarifies who is responsible for coordinating the curricula'), and (c) *Promoting a positive school learning climate* (e.g., 'Praises students for high achievements through reinforcements such as prestigious roles or mentioning them in the school paper or website'). Subject coordinators rated principals' IL on a 6-point Likert scale ranging from *Never* (1) to *Always* (6).

Principals' systems thinking. To assess the frequency at which a principal displayed ST competencies, subject coordinators answered the 17-item PST scale validated for schools by Nadav (2018). The CFA indicated good goodness-of-fit indexes, $\chi^2(50) = 118.64$, CFI = .929, IFI = .931, RMSEA = .078. Based on CFA, PST includes four system thinking competencies: (a) *Evaluating significance* (e.g., 'The principal tends to take unexpected occurrences into account'); (b) *Openness to a variety of opinions* (e.g., 'The principal engages in dialogue with those holding educational outlooks that differ from his/her own'); (c) *Leading wholes* (e.g., 'The principal attempts to identify repetitive patterns in the information at hand'); and (d) *Adopting a multidimensional view* (e.g., 'During decision-making, the principal tends to view the entire picture before examining its details'). Subject coordinators rated the PST competencies on a 5-point Likert scale ranging from *Never* (1) to *Always* (5).

Subject coordinators' job satisfaction. Subject coordinators' job satisfaction was assessed using Zak's (1975) 10-item scale (e.g., 'Overall I'm satisfied with my job'). Subject coordinators responded on a 5-point Likert scale, ranging from *Strongly disagree* (1) to *Strongly agree* (5).

Subject coordinators' organizational commitment. To measure subject coordinators' organizational commitment, we have used Mowday et al.'s (1979) Organizational Commitment Questionnaire, adapted by Somech and Bogler (2002) which was specifically adjusted to suit the educational setting context. This 15-items scale assess the strength of an individual's identification with and involvement in a particular organization (e.g., 'I talk about

this school to my friends as a great school to work for'). Subject coordinators responded on a 5-point Likert scale, ranging from *Strongly disagree* (1) to *Strongly agree* (5).

Control variables. In the present study school size and principals' education and tenure (no. years working in the same school) were used as control variables. Previous research has indicated that organization size is related to leader's IL and positively correlated with organizational performance (Barnett *et al.*, 2002; Berson, Da'as and Waldman, 2015). Both principal tenure and principal education were shown to correlate with principals' leadership tendencies toward management and/or toward instructional tasks (Louis and Robinson, 2012).

Data analysis

This study performs the analysis with a two-step structural equation modeling (SEM) approach (Anderson and Gerbing, 1988), including measurement model and structural model testing. CFA was used to test the measurement model and SEM (AMOS 21.0) was used to test the structural model and to evaluate the relationships among the constructs, as proposed in the conceptual model in Figure 1 (Jöreskog and Sörbom, 1996). SEM was used because, first, it allows to test series of relationships between variables and get estimated parameters simultaneously. Second, SEM has become the dominant analytical tool for testing cause-effect-relationships models with latent variables.

To account for the mediation effects, the complete mediation model was tested using the SEM approach suggested by James, Mulaik and Brett (2006). First, it allows for testing of full as well as partial mediation; if testing for partial mediation, a direct path is added from the initial variable to the outcome variable. Second, simultaneous testing of the significance of both the path from an initial variable to a mediator and the path from the mediator to an outcome (the test SEM applies) provides the best balance of Type I error rates and exhibits greater statistical power relative to other approaches (MacKinnon *et al.*, 2002).

In the present study, the full mediating model describes the relationships between the principals' IL (initial variable) and PST (mediating variable), and between PST (mediating variable) and subject coordinators' job attitudes of job satisfaction and organizational commitment (outcome variables). To support the full mediation, the mediation effects of PST was tested by comparing the fully mediated (hypothesized) model (M1) with an alternative, partially mediated model (M2) for subject coordinators' job attitudes. Specifically, M2 added a possible direct effect between principals' IL and subject coordinators' job satisfaction and organizational commitment.

Because SEM is primarily based on model fitting and selection, we used the fit indices of chi-square statistic divided by degrees of freedom (χ^2/df), Comparative Fit Index (CFI), Tucker-Lewis coefficient (TLI), Incremental Fit Index (IFI), and Root Mean Square Error of Approximation (RMSEA) to assess the fit of the research model (Jöreskog and Sörbom, 1996) and path estimates to describe how well the models estimate the input data set (Bollen, 1989). The χ^2 values provide a statistical basis for comparing the relative fit of nested models. Significant improvement in fit for M1 over M2 would confirm the mediation effects of PST. Finally, the bootstrapping procedure based on a 2,000 bootstrap sample size to ascertain the presence of indirect effects was used (Preacher and Hayes, 2008). The bootstrapping approach is recommended for analyzing indirect effects when testing for mediation in small samples due to biased variance and standard error estimates using conventional mediation approaches (Hayes, 2013). To enable bootstrapping in the AMOS statistical software package, missing values in the dataset were imputed using regression imputation.

Results

The descriptive statistics, internal reliability, AVE, MSV and inter-correlations among study variables are presented in Table 1.

-Insert Table 1 about here-

Hypotheses testing and overall model fit

Measurement model testing

We first conducted a CFA to determine unidimensionality, discriminant validity, and convergent validity of the variables (Joreskog and Sorbom, 1996). We validated the construct measures for the PST, IL, and subject coordinators' job satisfaction and organizational commitment using CFA, which is most suitable for confirming whether construct measures load on their respective a priori defined constructs (Browne and Cudek, 1993). The measurement model provided a good fit to the data, $\chi^2(571) = 838.230$, CFI = .919, TLI = .911, IFI = .921, RMSEA = .045, and all of the indicators had statistically significant ($p < .01$) factor loadings ($> .50$) on their intended constructs, establishing the posited relationships among indicators and constructs (Hair, Anderson, Tatham and Black, 1998). During content validation procedures, some of the scale items were eliminated.

Convergent validity (Table 1) was achieved by meeting the three following conditions (Fornell and Larcker, 1981). First, all factor loadings in CFA were significant at $p < .001$. Second, the average variance extracted (AVE) for all research constructs exceeded 0.50, indicating that the items of the proposed scales explain sufficient variance in the underlying construct than that attributable to the measurement error. Third, the reliabilities for each of the proposed constructs were higher than .70. So, convergent validity was achieved.

Regarding discriminant validity: First, AVE should be greater than 0.50 (Fornell and Larcker, 1981). Second, AVE should be greater than maximum shared variance (MSV). As seen in Table 1, AVE of PST, IL, job satisfaction and organizational commitment meet these conditions. So, discriminant validity was achieved for the measurement model. The CFA thus confirmed that the IL, PST, and work attitude scales measured distinct constructs.

Structural model testing

As seen in Figure 2, the hypothesized fully mediated model (M1) presented a good fit to the data, $\chi^2(49) = 88.142$; $\chi^2/df = 1.799$; CFI = .956; IFI = .957; TLI = .941; RMSEA = .059. Comparison of fit for the proposed hypothesized model (M1) against the competitive partially mediating model (M2) showed no significant gains in explanatory power for the alternative model, $\Delta\chi^2(2) = 3.69$, $p > .10$, although M2 exhibited good fit indices, $\chi^2(47) = 84.450$; $\chi^2/df = 1.797$; CFI = .958; IFI = .959; TLI = .941; RMSEA = .059. These results suggested that the full mediation model (M1) fits the data better than the partial mediation model (M2).

In the present study, school size and the principal characteristics of tenure and education were used as control variables in testing all the hypotheses. As seen in Figure 2, the control variables were all significant. Moreover, findings (see Figure 2) indicated that principals' IL explained 51% of the variance in PST, and PST explained 33% of the variance in organizational commitment and 11% of the variance in job satisfaction.

In line with the first hypothesis, findings (see Figure 2) indicated that IL was positively and significantly correlated to PST ($\beta = .59$, $p < .001$). Results also supported both parts of the second hypothesis, whereby PST positively and significantly correlated to job satisfaction ($\beta = .32$, $p < .001$) and to organizational commitment ($\beta = .57$, $p < .001$) (see Figure 2). Finally, findings also supported the third hypothesis, indicating that PST fully mediated the relationships between IL and subject coordinators' job satisfaction and organizational

commitment. Bootstrap analyses conducted to provide a more rigorous test of whether the mediated effects found in the model were statistically significant (Shrout and Bolger, 2002). Data showed that the indirect effect of IL via PST was .34 on organizational commitment (lower bound = .22, upper bound = .48, $p = .001$) and .19 on job satisfaction (lower bound = .08, upper bound = 0.32, $p = .001$), confirming our hypotheses (see Table 2).

-Insert Figure 2 about here-

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Discussion

The present study was geared towards examining the leadership-related antecedents of a ST approach upheld by the principal, as perceived by subject coordinators, and the possible improvements in subject coordinators' job attitudes in relation to PST. The call for a more holistic approach to school leadership research and practices (Leithwood *et al.*, 2017) motivated the current study. Specifically, the present model examined the mediating role of PST in the relationships of principals' IL with regard to subject coordinators' organizational commitment and job satisfaction. Overall, our results provide additional support to previous research argument of reframing schools as complex systems in which faculty members should be encouraged to engage with an extended set of practices, concepts, resources, and sources of support (Crick *et al.*, 2016; Kruse, 2018).

First, the findings presented herein provide support for the linkages proposed in the model and support the proposition that the PST competencies of *evaluating significance*, *leading wholes*, *adopting a multidimensional view* and *openness to a variety of opinions* contribute to enhance the subject coordinators' job satisfaction and organizational commitment. Furthermore, the findings show that the PST mediates the relationships between principal's IL and subject coordinators' job satisfaction and organizational commitment. Through PST, principals articulate a theory of action to manage the system and its components

and leverage their interrelationships (Marshall and Fisher, 2018). Principals can enhance faculty members' job attitudes by conceptualizing various aspects of school life as one large system. This is brought about by an ability to understand that a current situation's seemingly separate or confusing details are actually parts of one big picture.

Opportunities for a more meaningful and supporting workplace, through *adopting a multidimensional view* and *openness to a variety of opinions*, seem to contribute to enlarging the scope of subject coordinators perspectives, from issues that are unique to their own subject to matters affecting the school organization as a whole. Similarly, *evaluating significance* and *leading wholes* on the part of the principals so as to envision elements of school life in light of their importance to the whole system seem to enhance the ability to develop an organizational system approach, which expands middle leaders' (i.e., subject-coordinators) understanding of the school system as a whole. This expanded scope may reinforce the commitment-related values of subject coordinators and job satisfaction.

These results also coincided with previous research that pinpointed work conditions and inner workplace support as significant predictors of commitment and satisfaction at the workplace (Collie, Shapka and Perry, 2011; Dou *et al.*, 2017). Previous research indicated that PST provides subject coordinators with more responsibility for school improvement based on a deeper understanding of the school system's "big picture," thereby encouraging the expansion of cooperation between principals and subject coordinators (Wells and Keane, 2008). Thus, through PST competencies, namely *leading wholes*, *adopting a multidimensional view*, *evaluating significance* and *openness to a variety of opinions*, principals may improve schools' work environment, promoting subject coordinators' job satisfaction and organizational commitment. These results deepen our knowledge of the significance of PST in relation to subject coordinators' attitudes toward their work and workplace.

Second, the present findings indicated a positive relationship between IL and PST. It seems that IL allows principals to ‘filter out’ the less essential elements of the school's complex and dynamic reality, while analyzing the most important instructional issues that need to be addressed, thereby promoting the conditions that enable the enactment of ST (Walker and Slear, 2011). By aggregating and integrating various data sources into a multidimensional framework, instructional leaders facilitate a holistic perspective that focuses on how the schools' subsystems function together (Supovitz, Sirinides and May, 2010). Such a systemic approach of improving teaching and learning seems to provide principals a means of seeing the school as an integrated, complex composition of many interconnected components that need to work together, enabling principals to enact ST competencies.

Finally, the research findings showed that IL is positively related to PST, which in turn enhanced subject coordinators’ job attitudes. These findings may be taken to support the idea that principals’ IL may contribute to their ST, which may also be seen as a means for explaining and helping tap the benefits of IL. These results are particularly important, emphasizing the necessity of examining the antecedents and consequences of PST (Biu and Baruch, 2011; Senge, 2006), especially because most schools can still be described as loosely coupled organizations with little connection among teachers, who remain quite autonomous within their classroom (Weick, 2009). In this sense, research has recognized the contribution of structural, cultural, and leadership characteristics based on a more systemic approach for enhancing school faculty members’ attitudes and interpersonal relationships (Anderson, Leithwood, and Louis, 2012). Yet, teachers and staff continue to work and learn primarily from individual and isolated experiences (Senge, 2012). These findings appear to emphasize the need for principals to enact ST activities in order to develop an organization’s systems approach, expanding subject coordinators’ perspectives to go beyond the immediate outcomes of their subject-matter to a broader perspective of the school system as an integrated whole.

Limitations and future studies

Several limitations of this study warrant further attention in future research. First, these self-reported data might be subject to bias and common method variance. Because the study sought to understand teachers' reactions to social context, self-reported data seemed to be the most appropriate for capturing employees' perceptions and appraisals of these variables (Fox and Spector, 1999). Our argument is consistent with the so-called Thomas Theorem (McCall, 2013), which asserts that individuals' perceived realities are indeed real for them, and so their consequences are real. Also, we have followed Podsakoff and his colleagues' (2003) recommendations to reduce common method variance. Yet, further research should use additional sources for evaluating subject coordinators' job attitudes. Second, the uniqueness of the sampled population and the fact that sample representativeness could not be ascertained restrict the ability to generalize the results, calling to explore the influence of PST as perceived by middle-leaders with different school functions, such as department heads or grade-level coordinators.

Third, the design of the present study does not permit direct evidence of causal links between IL, PST, and subject coordinators' job attitudes. Conceivably, the causal order could be reversed. Nor can reciprocal causality be ruled out, making it impossible to determine whether IL causes PST, or whether PST causes subject coordinators to perceive their principals as instructional leaders. Similarly, we could not determine whether organizational commitment and job satisfaction causes PST, or whether PST causes subject coordinators to exhibit organizational commitment and job satisfaction. Therefore, future research would do well to use longitudinal designs to further validate the causal inferences suggested here.

Fourth, this study examined only selected antecedent and outcome variables. Organizational culture, for example, is another antecedent to ST (Alavi and McCormick, 2004). Further research should extend the inquiry to investigate the impact of culture regarding

principals' tendencies to engage in ST activities. Moreover, future study could investigate the intervening role of job satisfaction on the relationship of PST to employees' work attitudes. Finally, researchers may wish to investigate PST's relations with other outcomes at both the team level (e.g., team effectiveness) and the organizational level (e.g., school violence, student academic achievements).

Implications

The present results may hold implications for policies involving the design and implementation of leadership tools and ST practices. Specifically, developing PST should be accompanied by development of a school-wide systemic approach. Toward this end, principals can design school practice fields, namely fields of play, where they can construct virtual worlds for the sole use of experimentation. Although such a communal deliberative practice field resembles the real action domain, it facilitates consideration of how variables that exist in the system are causally related in feedback loops, as part of a circuit of cause-and-effect processes. Finally, as researchers have come to recognize subject coordinators as a key factor related to school functioning and improvement (Day *et al.*, 2016; Somech and Naamneh, 2017), expansion of subject coordinators' prism from one of only performing – overcoming daily ('real') pedagogical problems – to one also entailing processes of rehearsing, experimenting, and simulating may nurture a systemic outlook by future school leaders and subject coordinators alike.

References

- Abbott I., and Bush, T. (2013), "Establishing and maintaining high-performing leadership teams: a primary perspective", *International Journal of Primary, Elementary and Early Years Education*, Vol. 41, pp. 586-602.
- Alavi, S.B. and McCormick, J. (2004), "Theoretical and measurement issues for studies of collective orientation in team contexts", *Small Group Research*, Vol. 35 No. 2, pp. 111-127.
- Anderson, J. C, and Gerbing, D. W. (1988), "Structural equation modeling in practice: A review and recommended two-step approach", *Psychological Bulletin*, Vol. 103, pp. 411-423.
- Anderson, S., Leithwood, K. and Louis, K.S. (2012), Data use: An exploration from the district to the school. In K. Leithwood & K. S. Louis (Eds.), *Linking leadership to student learning* (pp. 158-180), San Francisco, CA: Jossey-Bass.
- Barnett, R.R., Glass, J.C., Snowdon, R.I. and Stringer, K.S. (2002), "Size, performance and effectiveness: Cost-constrained measures of best-practice performance and secondary-school size", *Education Economics*, Vol. 10 No. 3, pp. 291-311.
- Bennett, N., Woods, P., Wise, C. and Newton, W. (2007), "Understandings of middle-leadership in secondary schools: a review of empirical research", *School Leadership and Management*, Vol. 27, pp. 453-470.
- Benoliel, P. (In press), "Managers as boundary spanners and school violence: The mediating role of school management teams", *Educational Management and Administration Leadership*.
- Berson, Y., Da'as, R. and Waldman, D.A. (2015), "How do leaders and their teams bring about organizational learning and outcomes?", *Personnel Psychology*, Vol. 68, pp. 79-108.
- Bertalanffy, L. (1968). *General system theory*. New York: Braziller.

- Bogler, R. and Somech, A. (2004), "Influence of teacher empowerment on teachers' organizational commitment, professional commitment and organizational citizenship behavior in schools", *Teaching and Teacher Education*, Vol. 20 No. 3, pp. 277-289.
- Bogler, R. and Nir, A.E. (2015), "The contribution of perceived fit between job demands and abilities to teachers' commitment and job satisfaction", *Educational Management Administration and Leadership*, Vol. 43 No. 4, pp. 541-560.
- Bollen, K.A. (1989). *Structural equations with latent variables*. New York, NY: Wiley.
- Bousquet, A. and Curtis, S. (2011), "Complexity theory, systems thinking and international relations", *Cambridge Review of International Affairs*, Vol. 24 No. 1, pp.43-62.
- Brazer, S.D. and Bauer, S.C. (2013), "Preparing instructional leaders: A model", *Educational Administration Quarterly*, Vol. 49, pp. 645-684.
- Brezicha, K., Bergmark, U. and Mitra, D.L. (2015), "One size does not fit all: Differentiating leadership to support teachers in school reform", *Educational Administration Quarterly*, Vol. 51, pp. 96-132.
- Browne, M. W., and Cudek, R. (1993), "Alternative ways of assessing model fit", In K. A. Bollen, J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park: CA, Sage.
- Bui, H.T.M. and Baruch, Y. (2010), "Creating learning organizations: A systems perspective", *Learning Organization*, Vol. 17 No. 3, pp. 208-227.
- Bui, H.T.M. and Baruch, Y. (2012), "Learning organizations in higher education: An empirical evaluation within an international context", *Management Learning*, Vol. 43 No. 5, pp. 515-544.
- Bush, T. and Glover, D. (2014), "School leadership models: What do we know?", *School Leadership and Management*, Vol. 34 No. 5, pp. 553-571.

- Carter, A. (2016), "Empowering middle leaders' trends in school leadership research on the principal's impact on school effectiveness", *Australian Educational Leader*, Vol. 38 No. 1, pp. 37-41.
- Chance, P.L. (2005), "Engaging communities through vision development: A systems approach to public relations", *Journal of School Public Relations*, Vol. 26 No. 2, pp. 139-155.
- Cheng, E.C.K. (2011), "Management strategies for promoting teacher collective learning", *US-China Education Review*, Vol. 8 No. 1, pp. 33-45.
- Collie, R.J., Shapka, J.D. and Perry, N.E. (2011), "Predicting teacher commitment: The impact of school climate and social-emotional learning", *Psychology in the Schools*, Vol. 48 No. 10, pp. 1034-1048.
- Crick, R.D., Barr, S., Green, H. and Pedder, D. (2017), "Evaluating the wider outcomes of schools: Complex systems modelling for leadership decisioning", *Educational Management Administration & Leadership*, Vol. 45 No. 4, pp. 719-743.
- Curran, P.J., West, S.G., and Finch, J.F. (1996), "The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis", *Psychological Methods*, Vol. 1, pp. 16-29.
- Dale, A. and Newman, L. (2005), "Sustainable development, education and literacy", *International Journal of Sustainability in Higher Education*, Vol. 6 No. 4, pp. 351-362.
- Day, C., Gu, Q. and Sammons, P. (2016), "The impact of leadership on student outcomes: How successful school leaders use transformational and instructional strategies to make a difference", *Educational Administration Quarterly*, Vol. 52 No. 2, pp. 221-258.
- Dou, D., Devos, G. and Valcke, M. (2017), "The relationships between school autonomy gap, principal leadership, teachers' job satisfaction and organizational

- commitment”, *Educational Management Administration and Leadership*, Vol. 45 No. 6, pp. 959-977.
- Dyehouse, M., Bennett, D., Harbor, J., Childress, A. and Dark, M. (2009), "A comparison of linear and systems thinking approaches for program evaluation, illustrated using the Indiana interdisciplinary GK-12", *Evaluation and Program Planning*, Vol. 32 No. 3, pp. 187-196.
- Fox, S., and Spector, P.E. (1999), “A model of work frustration-aggression” *Journal of Organizational Behavior*, Vol. 20 No. 6, pp. 915–931.
- Fornell, C., and Larcker, D.F. (1981), “Evaluating structural equation models with unobservable variables and measurement error” *Journal of Marketing Research*, Vol. 18 No. 2, pp. 39-50.
- Fullan, M. (2014), *The principal: Three keys to maximizing impact*. San Francisco, CA: Jossey-Bass.
- Gharajedaghi, J. (2011), *Systems thinking, managing chaos and complexity: A platform for designing business architecture*. Burlington, MA: Morgan Kaufmann.
- Gurr, D. and Drysdale, L. (2013), “Middle-level secondary school leaders: Potential, constraints and implications for leadership preparation and development”, *Journal of Educational Administration*, Vol. 51 No. 1, pp. 55-71.
- Hair, J.F., Anderson, P.E., Tatham, R.L., and Black, W.C. (1998). *Multivariate data analysis*. Englewood Cliffs, NJ: Prentice Hall.
- Hammond, D. (2005), “Philosophical and ethical foundations of systems thinking”, *Triple C*, Vol. 3 No. 2, pp. 20–27.
- Hallinger, P. (2011), “A review of three decades of doctoral studies using the principal instructional management rating scale: A lens on methodological progress in educational leadership”, *Educational Administration Quarterly*, Vol. 47, pp. 271-306.

- Hallinger, P. and Murphy, J. (1985), "Assessing the instructional management behavior of principals", *Elementary School Journal*, Vol. 86, pp. 217-247.
- Hallinger, P. and Wang, W.C. (2015), *Assessing instructional leadership with the Principal Instructional Management Rating Scale*. Dordrecht, Netherlands: Springer.
- Hallinger, P., Wang, W.C. and Chen, C.W. (2013), "Assessing the measurement properties of the principal instructional management rating scale: A meta-analysis of reliability studies", *Educational Administration Quarterly*, Vol. 49 No. 2, pp. 272-303.
- Hayes, A.F. (2013), *An introduction to mediation, moderation, and conditional process analysis: A regression-based approach*, New York, NY: Guilford.
- Hsieh, J. Y. (2016), "Spurious or true? An exploration of antecedents and simultaneity of job performance and job satisfaction across the sectors", *Public Personnel Management*, Vol. 45 No. 1, pp. 90-118.
- Hoy, W.K. and Miskel, C.G. (2013), *Educational administration: Theory, research, and practice*. (9th ed.), New York: McGraw-Hill.
- Hunt, J. (2013), *Accountability is the key: Unlocking school potential through enhanced educational leadership*. Lanham, MD: Rowman and Littlefield.
- James, L.R., Mulaik, S.A. and Brett, J.M. (2006), "A tale of two methods", *Organizational Research Methods*, Vol. 9 No. 2, pp. 233-244.
- Jöreskog, K. and Sörbom, D. (1996), *LISREL VI: Analysis of linear structural relationships by maximum likelihood and least square methods*. Mooresville, IN: Scientific International.
- Joo, B. and Park, S. (2010), "Career satisfaction, organizational commitment, and turnover intention: The effects of goal orientation, organizational learning culture and developmental feedback", *Leadership & Organization Development Journal*, Vol. 31, pp. 482 – 500.

- Joo, B., Yoon, H.J. and Jeung, C. (2012), "The effects of core self-evaluations and transformational leadership on organizational commitment", *Leadership and Organization Development Journal*, Vol. 33, pp. 564-582.
- Judge, T.A. and Kammeyer-Mueller, J.D. (2012), "Job attitudes", *Annual Review of Psychology*, Vol. 63, pp. 341-367.
- Kreis, K. and Brockopp, D. Y. (1986), "Autonomy: A component of teacher job satisfaction", *Education*, Vol. 107 No. 1, pp. 110–115.
- Kruse, S. (2018), Schools as soft systems: Addressing the complexity of ill-defined problems, In *Leading holistically: How schools, districts, and states improve systemically*, London: Routledge.
- Leithwood, K. (2016), "Department-head leadership for school improvement." *Leadership and Policy in Schools*, Vol. 15 No. 2, pp. 117-140.
- Leithwood, K., Sun, J., and Pollock, K. (2017). How school leaders contribute to student success. The four paths framework. In *Studies in Educational Leadership*, 23. Springer: Switzerland.
- Lingard, B. and Rawolle, S. (2011), "New scalar politics: Implications for education policy", *Comparative Education*, Vol. 47 No. 4, pp. 489-502.
- Louis, K.S. and Robinson, V.M. (2012), "External mandates and instructional leadership: School leaders as mediating agents", *Journal of Educational Administration*, Vol. 50, pp. 629-665.
- Louis, K., Leithwood, K., Wahlstrom, K.L. and Anderson, S.E. (2010), *Investigating the links to improved student learning*. Minneapolis, MN: University of Minnesota.
- Marshall, J., and Fisher, D. (2018). "Making preparation practical: Reducing aspiring administrator time to competence through five types of leaderly thinking", *Journal of School Administration Research and Development*, Vol. 3 No. 1, pp. 74-80.

- McCall, G.J. (2013), Interactionist perspectives in social psychology, In J. DeLamater, and A. Ward (Eds.), *Handbook of Social Psychology* (2nd ed.). New York, Springer.
- MacKinnon, D.P., Lockwood, C.M., Hoffman, J.M., West, S.G. and Sheets, V. (2002), “A comparison of methods to test mediation and other intervening variable effects”, *Psychological Methods*, Vol. 7, pp. 83-104.
- Meyer, J.P. (2016), Employee commitment: Looking back and moving forward. In J.P. Meyer (Ed.), *Handbook of employee commitment* (pp. 511-527), Northampton, MA: Edward Elgar.
- Minarik, M. M., Thornton, B. and Perreault, G. (2003), "Systems thinking can improve teacher retention", *Clearing House*, Vol. 76 No. 5, pp. 230-234.
- Mowday, R.R., Steers, R.M. and Porter, L.W. (1979), “The measurement of organizational commitment”, *Journal of Vocational Behavior*, Vol. 14, pp. 224-247.
- Nadav (2018). *Systems Thinking in Educational Leadership: Structure Validation*. Thesis (M.A.), Bar Ilan University, Ramat Gan, Israel.
- Neumerski, C.M. (2012), “Rethinking instructional leadership, a review: What do we know about principal, teacher, and coach instructional leadership, and where should we go from here?”, *Educational Administration Quarterly*, Vol. 49, pp. 310-347.
- Ng, S. and Chan, T.K. (2014), “Continuing professional development for middle leaders in primary schools in Hong Kong”, *Journal of Educational Administration*, Vol. 52 No. 6, pp. 869-886.
- Northouse, P.G. (2016). *Leadership: Theory and practice* (7th ed.). Thousand Oaks, CA: Sage.
- Osborne-Lampkin, L. and Cohen-Vogel, L. (2014), ““Spreading the wealth”: How principals use performance data to populate classrooms”, *Leadership and Policy in Schools*, Vol. 13, pp. 188-208.

- Pang, N.S.K. and Pisapia, J. (2012), "The strategic thinking skills of Hong Kong school leaders: Usage and effectiveness", *Educational Management Administration & Leadership*, 40 Vol. No. 3, pp. 343-361.
- Park, I. (2005), "Teacher commitment and its effects on student achievement in American high schools", *Educational Research and Evaluation*, Vol. 11 No. 5, pp. 461-485.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: A critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88, pp. 879-903.
- Preacher, K.J. and Hayes, A.F. (2008), "Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models", *Behavior Research Methods*, Vol. 40, pp. 879-891.
- Price-Mitchell, M. (2009), "Boundary dynamics: Implications for building parent-school partnerships", *School Community Journal*, Vol. 19 No. 2, pp. 9-26.
- Rigby, J.G. (2014), "Three logics of instructional leadership", *Educational Administration Quarterly*, Vol. 50, pp. 610-644.
- Robbins, S.P. and Judge, T.A. (2016), *Essential of organizational behavior*. New York, NY: Pearson.
- Robinson, V.M., Hohepa, M. and Lloyd, C. (2009), *School leadership and student outcomes: Identifying what works and why. Best evidence synthesis iteration*. Wellington, New Zealand: Ministry of Education.
- Saiti, A. (2015), "Conflicts in schools, conflict management styles and the role of the school leader: A study of Greek primary school educators", *Educational Management Administration & Leadership*, Vol. 43 No. 4, pp. 582-609.

- Schechter, C., and Qadach, M. (2012), "Toward an organizational model of change in elementary schools", *Educational Administration Quarterly*, Vol. 48 No. 1, pp. 116-153.
- Schechter, C., and Qadach, M. (2016), "Promoting learning in schools: Principals' learning mechanisms," *Leadership and Policy in Schools*, Vol. 15 No. 2, pp. 141-167.
- Shaked, H., Benoliel, P., Nadav N., and Schechter, C. (2018). Principals' systems thinking: The meaning and measure of a leadership construct. In H. Shaked, C. Schechter & A. Daly (Eds). *Leading holistically: How schools, districts, and states improve systemically*. New York: Routledge.
- Shaked, H., and Schechter, C. (2017), "System thinking among school middle leaders," *Educational Management, Administration and Leadership*, Vol. 45 No. 4, pp. 699-718.
- Shrout, P.E. and Bolger, N. (2002), "Mediation in experimental and nonexperimental studies: New procedures and recommendations", *Psychological Methods*, Vol. 7, pp. 422-445.
- Senge, P. (2006), *The fifth discipline: The art and practice of the learning organization*. (2nd Eds). New York, NY: Doubleday.
- Senge, P.M. (2012), "Creating schools for the future not the past for all students", *Leader to Leader*, Vol. 65, pp. 44-49.
- Skaalvik, E.M. and Skaalvik, S. (2017), "Motivated for teaching? Associations with school goal structure, teacher self-efficacy, job satisfaction and emotional exhaustion", *Teaching and Teacher Education*, Vol. 67, pp. 152-160.
- Somech, A. and Naamneh, M. (2017), "Subject coordinators as boundary managers: The impact on team learning and organizational outcomes", *Educational Management Administration and Leadership*.

- Somech, A. and Bogler, R. (2002), “Antecedents and consequences of teacher organizational and professional commitment”, *Educational Administration Quarterly*, Vol. 38 No. 4, pp. 555-577.
- Stacey, R.D., Griffin D. and Shaw P. (2000), *Complexity and management fad or radical challenge to systems thinking?* London, UK: Routledge.
- Stronge, J.H., Richard, H.B. and Catano N. (2008). *Qualities of effective principals*. Alexandria: Association for Supervision and Curriculum Development.
- Supovitz, J., Sirinides, P. and May, H., (2010), “How principals and peers influence teaching and learning”, *Educational Administration Quarterly*, Vol. 46 No. 1, pp. 31–56.
- Tejeda, J. and Ferreira, S. (2014), “Applying systems thinking to analyze wind energy sustainability”, *Procedia Computer Science*, Vol. 28, pp. 213-220.
- Thornton, B., Peltier, G. and Perreault, G. (2004), "Systems thinking: A skill to improve student achievement", *Clearing House*, Vol. 77 No. 5, p. 222.
- Thorpe, A. and Bennett-Powell, G. (2014), “The perceptions of secondary school middle-leaders regarding their needs following a middle-leadership development programme”, *Management in Education*, Vol. 28 No. 2, pp. 52-57.
- Walker, J. and Slear., S. (2011), “The impact of principal leadership behaviors on the efficacy of new and experienced middle school teachers”, *National Association of Secondary School Principals Bulletin*, Vol. 95 No. 1, pp. 46-64.
- Wells, C. and Keane, W.G. (2008), “Building capacity for professional learning communities through a systems approach: A toolbox for superintendents”, *AASA Journal of Scholarship and Practice*, Vol. 4 No. 4, pp. 24-32.
- Weick, K.E. (2009), *Making sense of organization: Vol. 2. The impermanent organization*. Chichester, UK: Wiley.
- Zak, I. (1975), *Job satisfaction: a causal model*, School of Education, Tel Aviv University.

Table 1: Descriptive Statistics, internal reliability, AVE, MSV and Intercorrelation Matrix for Study Variables *N*= 226

	<i>M</i>	AVE	MSV	α	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
1 IL: Total	3.87 (.78)	.88	.42	.89	1	.83***	.87***	.90***	.53***	.49***	.36***	.39***	.43***	.28***	.37***	-.19**	.33**	-.16*	
2 IL: School mission	3.82 (.95)			.75		1	.61***	.67***	.47***	.44***	.27***	.35***	.42***	.27***	.39***	-.26***	.32***	-.18**	
3 IL: Instructional program	3.84 (.83)			.78			1	.63***	.37***	.35***	.26***	.26***	.30***	.15*	.19**	-.09	.28***	-.12	
4 IL : Climate	3.93 (.91)			.80				1	.53***	.49***	.38***	.40***	.42***	.30***	.40***	-.17***	.27***	-.13*	
5 PST: Total	3.60 (.58)	.64	.41	.87					1	.76***	.79***	.83***	.78***	.28***	.52***	-.40***	.13*	-.06	
6 PST: Evaluating significance	3.57 (.72)			.71						1	.47***	.50***	.46***	.17***	.45***	-.32***	.13*	-.11	
7 PST: Openness to a variety of opinions	3.67 (.69)			.77							1	.57***	.47***	.23***	.34***	-.35***	.02	-.09	
8 PST: Leading wholes	3.57(.77)			.76								1	.53***	.23***	.41***	-.35***	.10	-.03	
9 PST: Adopting a multidimensional view	3.58 (.77)			.72									1	.24***	.42***	-.27***	.15*	.04	
10 Job satisfaction	3.87 (.64)	.50	.45	.79										1	.55***	-.15*	.02	-.09	
11 Organizational commitment	3.66 (.71)	.51	.46	.82											1	-.26**	.09	.01	
12 Principal tenure	10.10 (4.56)															1	-.18**	.23**	
13 Principal education	1.97 (.42)																1	.03	
14 School size (Number of enrolled students)	407.81 (163.02)																		1

Note. IL = principals' instructional leadership. PST = Principals' system thinking. Principal Education was coded 1=BA; 2=MA; 3=PhD

AVE= Average Variance Extracted. MSV= Maximum Shared Variance

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 2. Results of SEM and bootstrapping for predicting the relationship of Instructional leadership to PST (mediator) on organizational commitment and job satisfaction (Outcome variables)

Mediation pathway	X-M	M-Y	Mediation	Bootstrapping	
				Confidence interval (95%)	upper
Instructional Leadership -> PST-> Organizational commitment	.59***	.57***	.34***	.48	.23
Instructional Leadership -> PST-> Job satisfaction	.59***	.32***	.19**	.32	.08

Note. PST = principal systems thinking.

** $p < .01$, *** $p < .001$

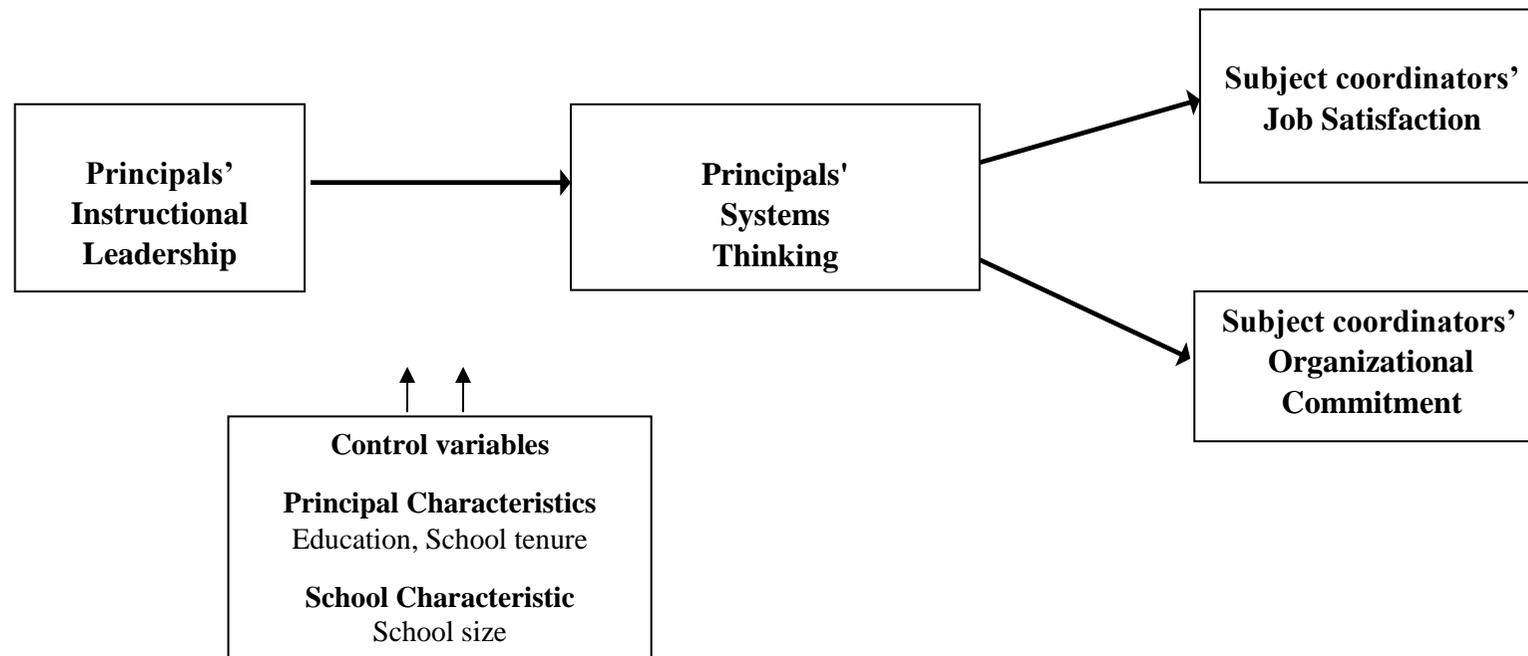


Figure 1. Proposed research model: Principals' systems thinking mediates the relations between principals' instructional leadership and subject coordinators' job satisfaction and organizational commitment.

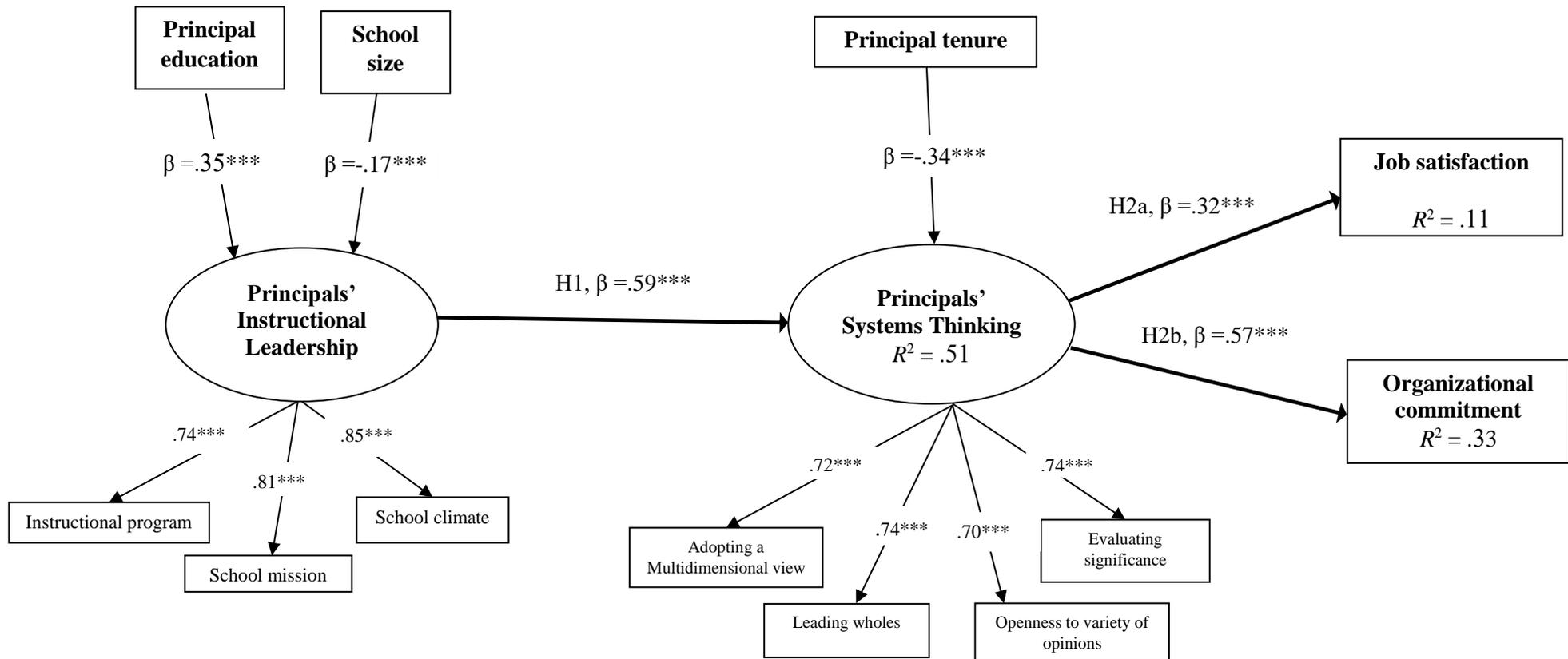


Figure 2. SEM results for the proposed full mediation model (M1).

Standardized parameter estimates for the theoretical model; $\chi^2(49) = 88.142$; $\chi^2/df = 1.799$; CFI = .956; IFI = .957; TLI = .941; RMSEA = .059.

* $p < .05$, ** $p < .01$, *** $p < .001$.