Exploring Relationships among Organizational Factors, Teachers’ Attitudes toward Evidence-Based Practices, and Implementation of Universal Prevention Programs

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Dedication

I want to dedicate this dissertation to my dearest parents, brother, grandparents, my greatest mentor in life and academia - Dr. Clayton Cook and his families (Eleanor, Willa, and Dr. Marcia Jensen-Cook), the wonderful people/professors who supported me to survive and thrive in graduate school in a foreign land - Drs. Amanda Sullivan, Gerald August, LeAnne Johnson, James Mazza, Janine Jones, Annie Hansen-Burke, Kristine Piescher, Howard Fan, Heather Applegate, and Robin Codding, as well as everyone I met and learned from through the six-year saga in pursuit of my Ph.D.
Abstract

Decades of research have produced a wide range of evidence-based programs and practices (EBPs) for use in schools. However, the existence of EBPs alone is insufficient to produce changes in student outcomes, as promoting positive student outcomes depends on successful implementation. Research has identified numerous factors that either enable or obstruct the successful implementation of EBPs, including outer context (e.g., policy), inner context (e.g., leadership and climate), and innovation-specific (e.g., the complexity of an intervention) factors. Despite the influence of these factors, successful implementation ultimately resides with the decisions and behaviors of individual implementers (e.g., teachers). Attitudes toward EBPs have garnered significant attention across service sectors as an important factor that is linked to successful implementation. However, there is limited research that has examined the relationship among individual-level factors, such as attitudes toward EBPs, and school organizational factors, such as leadership and climate. Moreover, there is emerging findings highlighting the importance of assessing both general and implementation-specific organizational characteristics and how they interact to explain important implementation-relevant variables and outcomes. In light of these existing voids in the literature, the purpose of this study was to examine teachers' attitudes toward EBP in relation to general and implementation-specific leadership and climate hypothesized to influence the uptake and implementation of EBPs by teachers in school settings.

Keywords: Implementation Fidelity, Leadership, Climate, Organizational Implementation Context, Attitudes, School-Based Evidence-Based Practices
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Chapter 1: Introduction

Background

Numerous evidence-based universal prevention programs have been developed to prevent and address social, emotional, and behavioral (SEB) problems that interfere with students’ educational outcomes (Bruns et al., 2016). However, these evidence-based universal prevention programs are often not adopted, and if adopted, insufficiently delivered with fidelity to prevent and address SEB problems (Owens et al., 2014). Research has identified multi-level determinants that either enable or obstruct the successful implementation of evidence-based practices (EBP). Research has suggested that factors associated with the immediate setting in which implementation occurs and the individuals who are expected to implement evidence-based practices are most closely associated with successful implementation. For example, factors characterizing the inner context of the setting where implementation happens, such as site-based leadership and climate are associated with implementation outcomes (Lyons et al., 2018). Moreover, characteristics of the individuals who are expected to implement an EBP, such as their attitudes toward EBPs and burnout, are likely to be associated with the adoption and delivery of EBPs (Cook et al., 2018). Notwithstanding the importance of inner context and individual-level factors, limited research has examined the cross-level association between individual-level factors, such as attitudes, and school-level organizational factors, such as leadership and climate, and the relationship to implementation outcomes. The purpose of this study was to examine the cross-level associations between general and implementation-specific organizational factors and teachers’ attitudes toward
evidence-based practices, as well as the interaction between these two as it relates to the implementation fidelity of evidence-based universal prevention programs.

**School as the Ideal Setting for Evidence-Based Universal Prevention**

Schools represent the optimal setting for the delivery of universal prevention programs that target the prevention and remediation of SEB problems. Schools provide consistent access to students in a less stigmatizing setting that reduce barriers common to other child-serving settings (e.g., community mental health clinics), particularly for historically marginalized minority groups (Rones & Hoagwood, 2000a). As a result, there is a burgeoning interest to enhance school-based supports to prevent and address SEB problems, as well as promote academic success (Durlak, Weissberg, Dymnicki, Taylor & Schellinger, 2011).

Multi-tiered system of support (MTSS) has been advocated by researchers, policymakers, and practitioners as a proactive framework that helps organize the delivery of a continuum of evidence-based practices (EBPs) that aim to prevent and address student SEB and academic needs (Cook, Burns, Browning-Wright, & Gresham, 2010). MTSS is a proactive, prevention-oriented service delivery framework that aims to meet all students’ needs through the implementation of a continuum of EBPs via data-driven decision making (Strein, Hoagwood, & Cohn, 2003). The foundation of MTSS is the universal level of support, or tier one, which entails the delivery of EBP to all students with the goal of preventing problems and enhancing success-promoting factors (Rones & Hoagwood, 2000). Universal Tier 1 SEB supports include school-wide positive behavior interventions and supports (SWPBIS; Horner et al., 2009), social-emotional learning curricula (SEL; Durlak, Weissberg, Kymnicki, Taylor & Schellinger, 2011) such as
Promoting Alternative Thinking Strategies Curriculum (PATHS; Domitrovich, Cortes & Greenberg, 2007), and proactive classroom management strategies such as the Good Behavior Game (GBG; Kellam et al., 2011). Despite the development of numerous evidence-based prevention and intervention programs that address student SEB across multiple tiers, their large-scale adoption and high-quality implementation have been severely limited (Durlak & DuPre, 2008; Nese et al., 2016). This science-to-practice gap reduces the educational and public health benefits of evidence-based universal prevention programs and results in many students being unable to access the supports they need to be successful in school.

**Science-Practice Gap in Schools**

Despite decades of research elucidating universal EBPs that teachers can implement to promote better student SEB outcomes, there remains a significant gap between what research indicates works and what is actually carried out in everyday classroom settings (Gottfredson & Gottfredson, 2002; Kretlow & Helf, 2013). The science-practice gap is troubling considering the significant amount of resources invested in research and the millions of students who do not benefit from EBPs (O’Connell, Boat, & Warner, 2009). Several barriers impede the successful uptake and use of EBPs in schools, leading to poor service quality and inconsistent and incomplete implementation (Durlak & DuPre, 2008; Owens, Lyon, Brandt, & Warner, 2014). For instance, even when adopted, only 25–50% of EBPs are implemented by school personnel with comparable fidelity to the original efficacy trials, reducing their effects on classroom functioning (Gottfredson & Gottfredson, 2002). Successful translation of science into routine practice requires deliberate attention to the process of implementation and key
determinants that impact the adoption, delivery, and sustained use of EBPs (Forman et al., 2013).

Implementation Science

Given the widely acknowledged science-to-practice gap, the transdisciplinary field of implementation science has emerged that focuses on developing an understanding of how to effectively and efficiently translate scientific findings into routine community-based practice (Eccles & Mittman, 2006; Powell et al., 2012). The degree to which EBPs are delivered with fidelity and adequate reach (i.e., received by as many of the intended recipients as possible) influences their impact on client outcomes (Domitrovich and Greenberg, 2000; Durlak, 1998; Durlack & DuPre, 2008; Dusenbury, Brannigan, Falco, & Hansen, 2003). Delivering effective programs with adequate fidelity and reach is complicated and requires deliberate attention to determinants that either obstruct or enable the successful uptake and delivery of EBPs (Powell et al., 2015; Waltz et al., 2015). The field has simplified understanding of determinants and reached general consensus regarding the categorization of determinants based on their level of influence: (a) outer setting determinants (i.e., factors beyond the immediate setting in which implementation takes place, such as policy, central leadership, funding, etc.), (b) inner setting determinants (i.e., the specific setting in which implementation takes place), (c) determinants associated with individuals who are expected to adopt and deliver the practice (e.g., teachers’ beliefs, attitudes, burnout, etc.), and (d) determinants associated with the practice or intervention itself (Lyon & Bruns, 2019).

School Organizational Implementation Context
As mentioned above, schools serve as the most common ecological system for the delivery of universal SEB EBPs due to it serving as a setting where children naturally exist and the presence of qualified professionals (e.g. teachers, social workers, and school mental health professionals) who can deliver services. It is widely recognized that organizational aspects of a school building, such as leadership and climate, influence implementation (Locke et al., 2018). Researchers have referred to the specific microsystem in which implementation happens and implementers reside as the organizational implementation context (OIC; Lyon et al., 2018). The OIC represents a combination of factors that are more proximal and theoretically linked to implementer behavior than outer setting factors that lie outside of a school (e.g., district leadership, policy). OIC constructs create the conditions necessary to support EBP implementation (Lyon et al., 2018). Moreover, OIC constructs are hypothesized to be more precisely linked to implementation than general or molar constructs representing similar phenomena. Whereas general or molar organizational constructs are not strategically focused on implementation, OIC constructs reflect strategic, implementation-specific characteristics of the immediate environment in which implementation occurs that are more proximal to implementer behavior (Williams, Ehrhart, Aarons, Marcus, & Beidas, 2018).

**General and implementation-specific leadership in schools.** Studies indicate that support from leadership is linked to EBP implementation by school-based mental health providers (Langley et al., 2010) and teachers (Rohrbach et al., 1993), and impacts the outcomes of students participating in interventions (Kam et al., 2003). General leadership represents positive qualities of leaders, such as transformational leadership,
that support educators’ autonomy and sense of trust, yet it does not capture specific aspects of leadership that are more closely connected to implementation processes and outcomes. Implementation-specific leadership, on the other hand, reflects implementation-specific behaviors that leaders exhibit that is more strategically connected to implementation, such as being proactive about implementation or knowledgeable about the EBP being implemented (Aarons, Ehrhart, & Farahnak, 2014). Researchers have posited that general leadership qualities are necessary but insufficient to support EBP implementation (Aarons, Ehrhart, & Farahnak, 2014; Damschroder et al., 2009; Lyon et al., 2018). In addition, leaders must demonstrate implementation-specific leadership behaviors that help establish a more supportive environment that is conducive to implementation (Ehrhart et al., 2014).

**General and implementation-specific climate in schools.** Another key determinant of the school OIC is climate, which is often defined as "patterns of people's experiences of school life and perceptions of social norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures" (National School Climate Council, 2007, p.5). Organizational climate has a long history of research both inside and outside of education (Hoy, 1990). Organizational climate is reflected as both an organizational property when aggregated across individuals in a given setting and an individual psychological phenomenon when considered at the level of a single employee (Weiner, 2009). General organizational climate encompasses people’s shared perceptions of their sense of wellbeing and connection to their work environment (Hoy, 1990). Several studies have linked the general climate to broad performance outcomes (e.g., Mitchell, Bradshaw, & Leaf, 2010). One meta-analysis demonstrated that three
components of general organizational climate—cognitive, affective, and instrumental—were highly interrelated and evidenced structural relations with job satisfaction and organizational commitment (Mowday, Porter, & Steers, 1982). Applied to schools, general organizational climate is an important determinant of teacher job satisfaction, commitment to the school’s values and mission, and engagement (Ehrhart, Aarons, & Farahnak, 2014a; Thapa, Cohen, Guffey, & Higgins-D’Alessandro, 2013). However, general organizational climate does not reflect school staff’s perceptions regarding their shared experiences involving the implementation of EBPs.

Implementation-specific climate is a more focused and specific aspect of organizational climate that represents school staff’s perceptions based on whether they experience an EBP implementation effort as being expected, supported, and rewarded in their school (Ehrhart et al., 2026; Williams et al., 2018). Implementation-specific climate is considered more proximal to implementation outcomes because it reflects how staff think and feel about their experiences related to the adoption and delivery of an EBP effort. Schools that actively pursue EBP implementation are likely to include policies, supports, recognition systems, and communications from leadership that create the conditions that school staff experience and ultimately perceive related to an implementation effort. Since climate is based on staff perceptions, it is critical for staff to experience the above conditions or else they will perceive that their actions related to an EBP implementation are not expected, supported, or rewarded in their school, which is likely to influence individual-level factors that inhibit implementation outcomes (e.g., adoption, fidelity, and reach) that are critical to promoting student outcomes.

**Attitudes as a Pivotal Individual-Level Factor**
Variation in individual-level implementation is found regardless of whether implementers work in settings with optimal organizational factors in place (e.g., supportive leadership) or receive adequate implementation supports (e.g., quality training and coaching support; Kincaid, Childs, Blase, & Wallace, 2007; Sanford DeRousie & Bierman, 2012). Therefore, addressing individual-level factors (consisting of barriers or facilitators to implementation) is critical to the facilitation of implementers’ delivery of EBPs (Low, Smolkowski, & Cook, 2016). Teachers’ attitudes toward EBPs may influence the implementation of EBPs at many stages of the implementation process. When applying attitudes to EBP implementation, attitudes reflect teachers’ favorable or unfavorable evaluative judgments regarding the implementation of a given EBP in schools, which in turn is hypothesized to impact their implementation intentions and behaviors (i.e., fidelity). Both qualitative and quantitative research support the view that teachers’ attitudes toward certain practices and their own professional roles are likely to influence the successful implementation of EBPs (Bowden, Lanning, Pippin, & Tanner, 2003; Parcel, O’Hara-Tompkins, Harrist, & Basen-Engquist, 1995). Teacher attitudes exist within an inner organizational context (e.g., the school microsystem) that is characterized by policies, leadership, and climate. From this perspective, implementation outcomes can be increased by improving implementation-specific organizational factors (e.g., implementation-specific leadership and implementation climate) and promoting educators’ positive attitudes toward EBP directly, or some combination of the two (Han & Weiss, 2005; Forman et al., 2013).

**Theoretical basis for associations between contextual and individual factors.**

Social-cognitive psychology emphasizes the interactive social and cognitive processes...
that inform behavioral decision making by investigating how an individual’s actions are influenced by the way they perceive themselves, the attitudes they hold toward certain behaviors in question, as well as the social context in which they reside (Bandura, 2004). The Theory of Planned Behavior (TPB; Ajzen, 1991, 1985; Fishbein & Ajzen, 1975) is a widely established social-cognitive theory that has been used to predict and target behavior change (Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008). In reference to implementation, strategies informed by TPB have the potential to alter teachers’ attitudes, intentions, and implementation behaviors as a way of transporting EBPs into routine school-based service delivery.

According to the TPB, for successful EBP implementation, teachers must endorse positive intentions to implement, which is considered one of the most proximal predictors of the actual performance of a given set of behaviors (Ajzen, 1991, 1985; Fishbein & Ajzen, 1975). Attitudes are one of the main mechanisms that influence intentions, which reflect favorable or unfavorable beliefs toward a given behavior, such as the delivery of an EBP with fidelity (Eccles et al., 2007). Attitudes are also impacted by contextual factors associated with the environment in which someone is expected to perform a given set of behaviors (Ajzen, 1991). In this way, organizational factors of a given school are likely to be associated with teachers’ attitudes toward EBPs. In turn, both organizational factors and individual-level factors, such as attitudes, are likely to demonstrate an association with implementation outcomes (e.g., fidelity and reach). Indeed, consistent with theory, prior research supports the link between general and implementation-specific organizational factors and individual-level attitudes toward EBP with implementation outcomes (Cook, Lyon, Kubergovic, Browning Wright, & Zhang, 2015; Williams, 2018).
Moreover, preliminary research has suggested that the relationship between organizational factors and attitudes may vary depending on the specific dimension of attitudes (Cook et al., 2018). For example, attitudes that relate to whether staff perceives EBPs as appealing may have a stronger relationship than other dimensions, such as attitudes related to whether an EBP is required, as outcome expectancies have been shown to be an important set of beliefs underlying attitudes (Schwarzer, Lippke, & Luszczynska, 2011). However, there is limited research examining the cross-level associations between general and implementation-specific organizational factors and teachers’ attitudes toward evidence-based practices, as well as the interaction between these two as it relates to the implementation of evidence-based universal prevention programs.

**Gaps in Extant Literature and Rationale for the Current Study**

There are several gaps in the existing literature that warrants continued research that explores the associations between school-level organizational factors, teachers’ attitudes toward EBPs, and implementation outcomes. First, there has been limited research examining to what extent and how general and implementation-specific organizational factors, such as leadership and climate, are associated with and interact with one another in relation to teachers’ attitudes toward EBPs. Second, only a few studies to date have examined the interaction between general and implementation-specific organizational factors on individual-level factors. This is important as certain researchers have suggested that the association between implementation-specific factors (e.g., implementation-specific leadership) depends on general leadership qualities. For example, site leaders who are viewed as kind, good listeners, and supportive and who
exhibit implementation-specific leadership behaviors are more likely to influence implementation relevant variables, such as teachers’ attitudes toward EBPs, than leaders who possess general or implementation-specific leadership qualities alone. Third, it is unclear whether attitudes toward EBPs serve as a potential mechanism through which school organizational factors influence implementation outcomes. Theory would suggest that attitudes may serve as a potential social-cognitive mediator between organizational factors and implementation behavior (e.g., fidelity). Last, it is unclear whether observed relationships differ depending on the type of universal SEB EBP being implemented. For instance, certain EBP like SWPBIS represents school-wide approaches that may be more strongly associated with organizational factors than other types of EBPs that are more classroom-focused, such as social-emotional learning curriculum (e.g., PATHS). However, this remains an untested hypothesis. Collectively, the above gaps in the current literature warrant for research that aims to advance understanding of the relationships between general and implementation-specific organizational factors, teachers’ attitudes toward EBPs, and implementation outcomes.

**Purpose of the Current Study**

In light of the existing voids in the current literature, this study aimed to explore relationships among key organizational and individual-level factors associated with the implementation of universal evidence-based practices in school settings. Specifically, the purpose of this study was three-fold: (a) examine cross-level associations between general and implementation-specific leadership and climate and teachers’ attitudes toward EBPs; (b) explore whether general and implementation-specific leadership and climate interacts to explain variance in teachers’ attitudes toward EBPs; and (c)
determine whether teachers’ attitudes toward EBPs mediate the relationship between
general and specific implementation-specific leadership/climate and implementation
outcomes (i.e., fidelity). This study used secondary data from a large-scale Institute of
Educational Sciences funded research project, which focused on developing and
validating suited of measures of the school organizational implementation in the context
of real-world implementation efforts involving two different evidence-based universal
prevention programs (i.e., SWPBIS and PATHS).

Research Questions

Consistent with the purposes of this study, the following four research questions (RQs) were developed to guide this study and the corresponding data analytic approach. Prior to conducting analyses to address each of the proposed research questions, the specific dimensions of attitudes toward EBPs for inclusion in subsequent analyses will be identified by determining which ones have the most variability (e.g., standard deviation and range) while demonstrating significant bivariate correlations with organizational variables. These variables will then be used as the dependent variables (DVs) in RQ1 and RQ2 and as independent variables (predictors) in RQ3 and RQ4.

RQ1. At both school- and individual-levels, to what extent are general and implementation-specific leadership or climate associated with different dimensions of teachers’ attitudes toward EBPs after controlling for school- and individual-level covariates?

To address this research question, a series of hierarchical linear models will be fitted to examine the cross-level relationships between general and implementation-specific organizational factors (i.e., one model for general and
implementation-specific leadership and one for general and implementation-specific climate) and different dimensions of teachers’ attitudes toward EBPs. It is hypothesized that both general and implementation-specific leadership and climate will demonstrate significant positive relationships with different dimensions of teachers’ attitudes toward EBPs, with implementation-specific factors demonstrating stronger associations.

**RQ 2.** Based on significant findings from RQ1, to what extent do general and implementation-specific leadership or climate interact to explain variance in specific dimensions of individual-level teacher attitudes toward EBPs above and beyond each of the variables alone?

To address this research question, a new set of hierarchical linear models will be built based on the ones from RQ 1 by entering interaction terms, at both school- and individual-levels, between general and implementation-specific leadership or climate. Significant results will suggest that the association between an implementation-specific organizational factor (e.g., implementation-specific leadership) and different dimensions of teachers’ attitudes toward EBPs depends on the level of general factors (e.g., general leadership). Consistent with prior research (Williams et al., 2018), it is hypothesized that general factors will moderate the relationship between implementation-specific organizational factors and different dimensions of teachers’ attitudes toward EBPs. This would suggest, for example, that leaders must possess both general leadership qualities and implementation-specific leadership to create a conducive context that most supports teachers’ perceptions regarding if EBP was appealing.
RQ3. To what extent do general and implementation-specific factors (leadership and climate) and specific dimensions of teachers’ attitudes toward EBPs relate to the implementation outcome of universal EBPs (i.e., PATHS and SWPBIS, respectively)? Do the observed relationships vary by the type of universal EBP (i.e., PATHS versus SWPBIS)?

To address this research question, given the nature of the universal-level of SWPBIS as a school-wide approach, school-level aggregated data was used to model the relationship with implementation of SWPBIS, while individual teacher-level data was used to model the implementation of PATHS. The organizational factors (general and implementation-specific leadership and climate) and different dimensions of teachers’ attitudes toward EBPs were sequentially entered into a series of multiple regression models to predict implementation fidelity of either SWPBIS or PATHS. It was hypothesized that general and implementation-specific organizational factors and specific dimensions of teachers’ attitudes toward EBPs will separately and collectively demonstrate significant positive relationships with the implementation fidelity of SWPBIS and/or PATHS. Moreover, it was anticipated that implementation-specific organizational factors demonstrate stronger relationships with implementation fidelity than general organizational factors, which is then attenuated by the inclusion of specific dimensions of teachers’ attitudes (i.e., implying the potential mediation effects of attitudes).

RQ4. Expanding from the significant findings in RQ3, do specific dimensions of teachers’ attitudes toward EBP mediate the relationship between school organizational factors and
the implementation of a universal EBP (i.e., SWPBIS or PATHS fidelity)? Does the mediational effect of teachers’ attitudes toward EBP differ depending on the type of universal EBP (i.e., SWPBIS versus PATHS)?

Similar to research question 3, school-level aggregated data was used for SWPBIS fidelity, while individual teacher-level data was used for PATHS fidelity. The nonparametric bootstrapping analysis of mediation effects via PROCESS (Preacher & Hayes, 2004; Preacher, Rucker, & Hayes, 2007) was used to detect the mediational effect in a holistic manner instead of the traditional causal steps approach by Baron and Kenny (1986). The mediational models examined whether implementation-specific organizational factors predict specific teachers’ attitudes toward EBP, which in turn predict the implementation of a specific type of universal EBPs (i.e., SWPBIS versus PATHS). It is hypothesized that specific dimensions of teachers’ attitudes toward EBPs will partially mediate the relationship between implementation-specific organizational factors and the implementation fidelity of specific universal EBP.

Significance of the Current Study

This study has significance to inform educational research and practice. First, this study aims to advance school-based implementation research by examining hypothesized relationships among general and implementation-specific organizational factors, teachers’ attitudes toward EBPs, and EBP implementation. This will help add to the conceptual understanding of the extent to which and how these factors relate to one another, which can inform more precise theories of implementation that explain how successful implementation occurs in schools. Second, this study may add additional evidence that
validates an existing suite of pragmatic measures that assess key organizational and individual-level factors hypothesized to impact school-based implementation. Third, this study could inform ways of training school leaders to ensure they have the necessary knowledge and skills to effectively support implementation. For example, if general leadership and implementation-specific leadership interact to predict teachers’ attitudes toward EBPs and implementation of universal EBPs, then interventions that support leaders’ development and use of knowledge and skills in these areas will be an important avenue to pursue in future research. Moreover, if general and implementation-specific climate are both found to predict teachers’ attitudes toward EBPs and implementation of universal EBPs, then future research needs to explore whether intentionally improving these aspects of a school organization causally lead to improvements implementation-relevant outcomes. Finally, this study has significance in its implications for practice by emphasizing the importance for educational professionals to attend to critical determinants within a given school setting that is likely to enable or obstruct successful implementation of universal SEB EBPs.

Chapter 2. Review of Literature

The purpose of this chapter is to provide an overview of the background literature that builds the conceptual understanding and rationale for this dissertation study. This chapter opens with a discussion of the student social, emotional and behavioral (SEB) needs in schools followed by the need to deliver universal prevention programs as part of a continuum of supports to prevent and address SEB problems that interfere with academic and life success. Next, the longstanding science-to-practice gap is described, with an emphasis on the growing field of implementation science and its promise to
improve student access to SEB supports.

As part of this discussion, the rationale for focusing on key organizational and individual-level factors within school settings is discussed to set up the emphasis on assessing general and implementation-specific organizational factors (i.e., leadership and climate) in relation to individual-level factors (e.g., attitudes) and implementation. Last, the chapter will end with a discussion of the voids in the current that build the case for this dissertation study’s focus on exploring relationships among school organizational factors, teachers’ attitudes toward EBPs, and implementation of evidence-based universal prevention programs.

Social, Emotional, and Behavioral (SEB) Needs in Schools

Roughly one out of five children have social, emotional, and behavioral (SEB) problems severe enough to warrant a mental health diagnosis (Costello et al., 2003). More often, students exhibit milder manifestations of SEB problems that do not reach clinical levels, but negatively influence their academic achievement (Goodman, Joyce, & Smith, 2011), and serve as risk factors for short- and long-term negative outcomes such as interpersonal problems, lower academic performance, truancy, dropout and adult unemployment (Beesdo & Knappe, 2012). Although recent federal and state mandates have prompted increased accountability of academic instruction and student outcomes (e.g., Common Core Standards, teacher evaluation standards), many schools struggle to address the needs of students who exhibit SEB difficulties (e.g., bullying, aggression, social withdrawal, defiance, etc.; Walker, Ramsey, & Gresham, 2005). Students with SEB needs can disrupt other students’ own learning, interfere with teachers' delivery of instruction, and/or inhibit their own success in school (Cook et al., 2013). For these
reasons, educators consistently report that student SEB needs are among their top concerns and needs for professional development (Bushaw & Lopez, 2010).

Moreover, given the increased emphasis on attending to student strengths and assets in educational research and practice, the focus is not solely on preventing or managing students’ SEB difficulties, but also to promote their social, emotional and behavioral skills and wellbeing. There is a growing body of evidence supporting that social-emotional skills, as manifested in the abilities of understanding emotions of self and other, regulating emotions, controlling attention, problem solving, and engaging in prosocial behaviors, serve as important enablers to school and life success (Cambourn, 2002; Denham, 2006; Denham, Basset & Zinser., 2012). A recent meta-analysis of 213 studies examining the impact of different social-emotional learning (SEL) programs indicated that these programs were not only associated with significant improvements in students’ social-emotional skills but were associated with an average of 11 percent increase on end-of-the-year academic achievement (i.e., test scores and grades; Durlak et al., 2011). Moreover, literature has shown that students’ social-emotional skills are better predictors of future academic performance than prior academic performance (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo 2000; Malecki & Elliott 2002).

In recognition of the importance of attending to and supporting student SEB wellbeing and functioning, schools are under pressure to adopt and implement evidence-based programs and practices (EBPs) (Adelman & Taylor, 2006; Kutash et al., 2006; Wagner & Davis, 2006). For example, there is consensus among researchers, policymakers, and practitioners that social and emotional learning (SEL) programs should be adopted and integrated with academic practices to promote school success
(Brackett & Rivers, 2014), as well as programs that cultivate positive school culture and climates that are conducive to promoting student SEB wellbeing. The starting point for addressing this nationwide push to promote SEB wellbeing and functioning is to select and implement high-quality programs and practices that have been shown to improve specific SEB outcomes of interest (i.e., EBPs).

**Evidence-Based Practices for SEB Needs in Schools**

Across a range of professions, there has been a significant push to transport scientific findings into routine practice in the settings in which children naturally exist, such as schools (Hoagwood, Burns, & Kiser, 2001; Kazak, et al., 2010; Titler, 2008). The movement to define, identify, and translate "what works" originated in the field of medicine in the early 1990s, and has since expanded to other fields, such as psychology and education (Davies, 2000; Trinder, 2000). Researchers refer to "what works" as evidence-based practices (EBPs), which the Institute of Medicine (2001) defines as "the integration of best research evidence with clinical expertise and client values." Others have defined EBPs as "research-based prevention/intervention programs with a strong empirical basis and have demonstrated positive outcomes in multiple well-designed studies" (Stoiber & DeSmet, 2010, p. 213). Over the last two decades, researchers in psychology and education have identified a number of EBPs that if adopted and implemented in everyday school settings, have the potential to prevent and ameliorate a range of academic, SEB problems that negatively impact short- and long-term outcomes (Cook, Smith, & Tankersley, 2012).

**School as an Ideal EBP Implementation Setting**
The potential promise and educational benefits of EBPs cannot be realized unless they are effectively adopted and delivered in the settings where children routinely show up and there is the presence of service providers. Therefore, it is imperative for EBPs to be delivered in a range of child-serving settings if children are going to access high-quality care that can prevent SEB problems from emerging and promote overall wellbeing and healthy functioning (e.g. Affordable Care Act, 2011; Klein, 2015). As documented in various studies, schools continue to serve as one of the primary settings in which youth receive behavioral health supports, with 70% to 80% of SEB services being delivered in schools (Farmer, Burns, Phillips, Angold, & Costello, 2003; Teich, Robinson, & Weist, 2008). Schools provide an easier access point, reduce the stigma associated with receiving services, and have the availability of professionals who can deliver needed services. Together, these make schools an ideal setting for the integration and delivery of SEB services with academic supports (Owens et al., 2014).

With this rationale in mind, researchers have developed and established numerous EBPs that cut across multiple tiers of prevention and intervention (universal, targeted, and intensive) for implementation in the school setting. For example, school-wide positive behavior intervention and supports (Sugai & Horner, 2002) and social-emotional learning curriculum (Zins, 2004) have been developed as universal supports that target preventing behavioral health problems and promoting academic outcomes (Sugai, Horner, & Gresham, 2002). Moreover, targeted small group interventions grounded in cognitive behavior therapy have been shown to decrease symptoms of social, emotional and behavioral problems and promote better academic-related outcomes (Ehntholt, Smith, & Yule, 2005; Neil & Christensen, 2009). Last, more intensive forms of school-
based treatment, such as individualized function-based behavior intervention plans (Ingram, Lewis-Palmer, & Sugai, 2005), have been shown to reduce the risk for negative outcomes and stabilize social, emotional, and academic functioning among high-risk students (Newcomer & Lewis, 2004). Given a combination of the above, policies have called for schools to deliver a continuum of EBPs that target preventing and ameliorating behavioral health problems (e.g. ESSA, 2015; Klein, 2015; Thomas & Brady, 2005).

Multi-Tiered System of Support to Organize the Delivery of EBPs in Schools

Although schools represent an ideal setting for the delivery of EBPs for SEB needs, schools often lack an adequate infrastructure for organizing these supports in a way that ensures students receive what they need (Adelman et al., 2005) and the quality of the practices that are implemented is limited (Evans & Weist, 2004). As mentioned above, the majority of the EBPs for SEB needs implemented in schools varies by the intensity of students’ specific problem and needs. Researchers and practitioners generally stratified the EBPs delivered in schools into three tiers for more efficient and effective implementation, which is grounded in the public health model of prevention (Bruns et al., 2016).

Numerous researchers have embraced and advocated for the use of multi-tiered systems of support (MTSS) as a way to efficiently and effectively organize and deliver a continuum of evidence-based practices in the education setting (Cook, Burns, Browning-Wright, & Gresham, 2010). MTSS represents a service delivery framework, grounded in the public health model of prevention and data-driven decision making. The aims of MTSS are to prevent, reverse, and minimize SEB problems while promoting social, emotional, and academic success among all individuals in a school (Strein, Hoagwood, &
MTSS involves the delivery of multiple tiers of supports, including universal (i.e. Tier 1), selected (Tier 2), and indicated (Tier 3) supports. Although the universal supports are essential to prevent the emergence of SEB problems and promote social, emotional, and academic success (Rones & Hoagwood, 2000), selected and indicated supports are integral parts of the service delivery framework to meet the needs of students who have not responded sufficiently to the universal supports and been identified as at-risk by the universal screening process.

For the MTSS to produce meaningful changes in student outcomes, there is a need to focus on key implementation outcomes to ensure that the programs and practices that are integrated within an MTSS are successfully adopted, used, and sustained (Cook et al., 2015; Proctor et al., 2011). For example, fidelity has been shown to be one of the most important implementation outcomes for a given program or practice to produce an effect (Perepletchikova & Kazdin, 2005). Fidelity refers to the extent to which core components of interventions are delivered as intended and shown to be effective (Dusenbury, Brannigan, Falco, & Hansen, 2003; McIntyre, Gresham, DiGennaro, & Reed, 2007).

In the extant implementation literature, several studies indicate that decreased fidelity is associated with decreased likelihood of therapeutic change (Erhardt, Barnett, Lentz, Stollar, & Reifin, 1996; Frank, Kupfer, Wagner, McEachran, & Cornes, 1991; Greenwood, Terry, Arreaga-Mayer, & Finney, 1992; Gresham, Gansle, Noell, Cohen, & Rosenblum, 1993; Henggeler, Melton, Brondino, Scherer, & Hanley, 1997; Huey, Henggeler, Brondino, & Pickrel, 2000). For instance, a study on the Oregon model of Parent Management Training (PMTO) found that when fidelity was high, PMTO yielded significantly improved parenting practices, however, the impact of the program was
much less when the program was implemented with low fidelity (Forgatch, Patterson, & DeGarmo, 2006). Other recent studies have found similar associations (Noel, 2006; Thomas, Baker, & Lorenzetti, 2007), such as the synthesis of nearly 500 studies from five meta-analyses by Durlak and DuPre (2008) who found that the magnitude of effect size estimates were two to three times larger when programs were delivered with sufficient fidelity than when implementation was sub-par. Moreover, based on a review of 59 additional quantitative studies, they found that higher levels of intervention fidelity (e.g., adherence and dosage) were often linked to better child outcomes. These findings are concerning considering the literature revealing that less than 50 percent of all implementers adopt and deliver with adequate fidelity even when provided with high-quality training and follow-up consultation (Becker, Bradshaw, Domitrovich, & Ialongo, 2013; Rogers, 2003). Considering the above, there is a pressing need for research that helps understand the factors (e.g., fidelity) and mechanisms that facilitate the successful adoption, implementation, and sustainment of EBPs that are integrated within a school’s MTSS.

Science-to-Practice Gap in Real-World School Settings

Despite the widespread push for implementing EBPs within an MTSS framework, research indicates that an implementation gap persists, with several barriers impeding the successful uptake, delivery and sustainment of EBPs in schools, leading to poor quality, consistent, and incomplete implementation (Durlak & DuPre, 2008; Evans & Weist, 2004). The actual adoption and routine implementation of EBPs in schools are highly variable, slow, and inconsistent, which undermines the beneficial impact of EBPs on student outcomes (Owens et al., 2014). Even if adopted, only 25 to 50% of EBPs were
carried out by school staff with a comparable fidelity to the original efficacy studies, which impaired their actual effects on real students or classrooms (Gottfredson & Gottfredson, 2002).

No matter how efficacious or effective an EBP has been shown to be in well-controlled studies, they will not produce positive student outcomes unless adopted and sufficiently implemented in real-world settings (Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010). There is a consensus that a significant gap between research and practice exists that negatively undermines the ability of EBPs to produce meaningful changes in child outcomes in the context of real-world settings, such as schools (Fixsen, Naoom, Blase, & Friedman, 2005). In addition, there are significant concerns about educational waste as there have been decades of investments made to establish EBPs, but the investments cannot be realized unless the EBPs are successfully incorporated into routine practice and consistently received by students (O'Connell, Boat, & Warner, 2009). Therefore, there is a critical need to systematically investigate the phenomena of EBP implementation in school settings to identify solutions to address the longstanding science-to-practice gap.

Indeed, it is commonly acknowledged by both researchers and practitioners that the promise of EBPs cannot be realized unless they are successfully translated into everyday settings in which providers and service recipients exist (e.g., schools). Transdisciplinary implementation research has shown that without deliberate efforts to bridge the science-to-practice gap through strategic implementation, there is will be uneven uptake, use, and sustainment of EBPs in (Fixsen, et al., 2005; Eccles & Mittman, 2006; McGlynn, Asch, & Adams, 2003). This is also true in education where research
suggests that an implementation gap exists, with several barriers impeding the successful uptake and use of EBPs in schools, leading to sub-optimal outcomes for students (Durlak & DuPre, 2008; Evans & Weist, 2004; Owens, et al., 2014). Thus, a focus on implementation is vital for society to benefit from the decades of research, and millions of public funds that have been invested in developing and identifying school-based EBPs.

**Implementation Science**

The science-to-practice gap has been a persistent problem across service settings, professions, disciplines, and countries (Eccles & Mittman, 2006; Hussey, Anderson, Osborn, & Feek, 2004; McGlynn, Asch, & Adams, 2003; Seddon, Marshall, & Campbell, 2001). Therefore, the multi-disciplinary field of implementation science has emerged and is evolving to identify solutions to address the pernicious research to practice gap that plagues most service sectors and increase client access to high-quality services (MP Eccles & Mittman, 2006; Kelly & Perkins, 2012; B. A. Rabin et al., 2015). Many argue that the origins of implementation science started with the seminal work of *Diffusion of Innovations* by Everett Rogers (1962). Pressman and Wildavsky (1973) then formally initiated a distinct area of scholarly work called *implementation*. However, it was not until the turn of the 20th century until there was the rapid emergence of the field of implementation science, including its own professional journal and conferences (Eccles & Mittman, 2006).

As an emerging field with high interest among researchers, practitioners, and policymakers, there have been significant efforts to advance the field through the dissemination of scholarly work, books, presentations conferences, and webinars (Fixsen et al., 2005; Eccles & Mittman, 2006). Implementation science is defined as the scientific
study of the factors that promote the systemic uptake and use of research findings into public policy and practice in order to improve the quality and outcomes of service delivery (Eccles & Mittman, 2006). While dissemination is the active and strategic spread of information about innovations to specific target audiences, implementation represents the process of putting high-quality practices in place by strategically supporting the adoption, delivery, and sustainment of EBPs (Greenhalgh, Robert, Bate, & Macfarlane, 2008; Rabin & Brownson, 2012).

**Current status of the field of implementation science.** Implementation science is a relatively young multidisciplinary field that has rapidly grown a robust and generalizable knowledge base. The overarching goal of implementation science is to promote the systemic uptakes of research and EBPs into public practice and policy for better service (Eccles & Mittman, 2006). Implementation science, like other fields, needs a comprehensive, robust and rigorous theoretical approach to guide implementation research that can be translated into everyday practice (May, 2013). In the early stage of its development, most research in the field lacked valid theoretical bases of implementation which impeded their capacity to understand, explain and predict implementation phenomena and constrained their findings of effective factors, mechanism and strategies for successful implementation (Eccles, Grimshaw, Walker, & Johnston, 2005; Eccles & Mittman, 2006; Michie, Johnston, & Abraham, 2005). In the last decade, the needs for well-established theoretical bases for implementation science were widely recognized. A wealth of new literature sought out in multiple disciplines in an effort to create, extend and validate different theories, models, and frameworks to facilitate implementation research.
Implementation research has accumulated a robust, generalizable knowledge base with high relevance to the training and practice of school psychology (Fixsen, Naoom, Blase, & Friedman, 2005; Forman et al., 2013; Perry et al., 2019). For example, implementation researchers have developed over 60 different implementation frameworks that can be used to guide implementation-oriented decision-making (Tabak, Khoong, Chambers, & Brownson, 2012), uncovered up to 601 unique determinants that obstruct or enable implementation success (Krauss et al., 2014), developed over 400 implementation instruments that could facilitate data-based decision making (Lewis et al., 2015), generated over 70 implementation strategies that represent the methods and techniques which can be used to influence implementation outcomes (Powell et al., 2015), and synthesized existing and novel theories of organizational and individual behavior change to better understand and explain the conditions for successful implementation (Nielsen, 2015).

**Implementation science in schools.** Research from health care, child welfare, and psychology dominates the implementation science literature (Eccles & Mittman, 2006; Graham, et al., 2006; Proctor, et al., 2009). However, findings from implementation science can inform both educational research and practice, as many of the findings are generalizable and applicable to other service sectors such as schools (Cook & Odom, 2013). For example, research in child welfare has identified specific leadership qualities that serve as key factors of the adoption and delivery of EBPs, as well as developed and evaluated specific implementation enhancement interventions to promote site-based leaders' ability to facilitate EBP implementation among providers (Aarons & Sommerfeld, 2012). These findings are generalizable to the school context in
which leadership across multiple levels is likely to influence the probability that EBPs are successfully selected, installed, and sustained over time. That being said, there is also a need to adapt specific findings from other fields to ensure they are relevant, appropriate, and comprehensible for EBP implementation efforts in the schools.

Educational researchers have largely focused on key implementation outcomes that are assessed at more active stages of the implementation process, such as feasibility, acceptability, appropriateness, and fidelity (e.g., Briesch, Chafouleas, & Neugebauer, 2013; Sanetti & Kratochwill, 2009). However, there are many other implementation factors across different stages of the implementation process elucidated through research from other disciplines (e.g., health care, public health, prevention science) that could inform educational research that aims to improve both implementation and student outcomes. For example, implementation literature agrees that there are several categories of factors (e.g., contextual, individual, and innovation specific) that facilitate or impede the uptake, use, and sustainment of EBPs (Metz & Bartley, 2012; Fixsen, et al., 2005). These key implementation factors have been integrated into implementation frameworks which serve as guides for both research and practice focusing on ameliorating the discrepancy between what research indicates works and what actually gets implemented in everyday service settings.

**Implementation Factors Relevant to the School Context**

Implementation is a process that unfolds in a given setting, via the collaborative efforts of the individuals who operate within a broader system or organization (Fixsen, et al., 2005). Most of the existing implementation frameworks outline key factors within and without a given service setting that influence implementation outcomes throughout
various stages of implementation (Nilsen, 2015; Tabak, Khoong, Chambers, & Brownson, 2012). Researchers have reached a general consensus about the critical role of these implementation factors. One example of this is the Consolidated Framework for Implementation Research (CFIR), which provides a synthesis of different frameworks to offer a common taxonomy of implementation factors and implementation processes (Damschroder et al., 2009).

A systematic review of existing research using the CFIR demonstrated that the CFIR has a wide range of applicability across different research and practice settings (Alexis Kirk et al., 2016). The CFIR specifies the following: (a) intervention characteristics (e.g., evidence, adaptability, complexity, reliability), (b) outer setting factors (e.g., policies and incentives), (c) inner setting factors (e.g., structural characteristics of the organization, organizational culture, implementation climate), (d) characteristics of individuals (e.g., self-efficacy, burnout), and (e) the process of implementation (e.g., planning, engaging, and evaluating; Bronfenbrenner, 1992; Tabak, et al., 2013). The CFIR recognizes that implementation takes place across multi-ecological levels, and thus, emphasizes the social-ecological nature of implementation by using “contextual domains” to categorize factors (Bronfenbrenner, 1992; Tabak, et al., 2013). Each domain refers to a level of the social-ecological model, such as microsystem for the inner settings domain, macro- and exo-systems for the outer settings domain (Tabak, et al., 2012; Bronfenbrenner, 1992).

As discussed above, schools serve as the most common microsystem where SEB EBPs are implemented by professionals (e.g. teachers, social workers, and school mental health professionals) to students. Therefore, aspects of the school environment and how it
relates to the characteristics of the individuals expected to implement (e.g. teachers’ attitudes toward EBPs) are hypothesized to influence both implementation and student outcomes. Preliminary research has established the association between client outcomes and the interplay between individual-level characteristics of implementers and inner setting factors, including clinicians’ attitudes toward EBPs, implementation climate, and leadership (Aarons, Ehrhart, Farahnak, & Hurlburt, 2015; Cook et al., 2018; Williams, Ehrhart, Aarons, Marcus, & Beidas, 2018). However, little comparable effort has been made to investigate similar topics to support the implementation of EBPs in schools. There is a need for research that investigates the interactional effects of individual-level implementers (i.e., teachers) and inner setting factors (i.e., leadership and climate). There is a need to better understand the interplay among individual-level implementers (e.g., teachers) and inner factors of the setting in which implementation takes place (e.g., a school building) and how to influence implementation outcomes and student SEB outcomes as part of real-world implementation efforts in schools. The following section is a discussion of the organizational implementation context (OIC) and corresponding factors that have been linked to improved EBP implementation.

**Organizational Implementation Context (OIC) Factors**

Inadequate attention to organizational characteristics of a given service setting is likely to undermine even the most well-resourced and thoughtful implementation efforts (Ehrhart, Aarons, & Farahnak, 2014b). The important organizational- and individual-level factors present within a given service setting have been outlined in prior work. The extant implementation literature has identified a wide collection of organizational
characteristics relevant to the implementation of EBPs, including but not limited to local policy, leadership, and climate (Chaudoir, Dugan, & Barr, 2013).

The organizational implementation context (OIC) is a term that has been coined to reflect the characteristics of the inner setting that are most relevant to the objective of EBP implementation. The OIC serves as the microsystem or immediate environment in which implementation occurs and implementers and clients reside. It denotes the factors associated with the inner setting that is most likely to influence front-line professionals' adoption, use, and sustainment of EBPs. When combined, factors of the OIC create an environment that is conducive to implementation success by influencing implementers’ decisions and behavior across different stages of the implementation process (Mendel, Meredith, Schoenbaum, Sherbourne, & Wells, 2008; Parcel et al., 1995; Scheirer, 1981). Conceptualized using the Exploration, Preparation, Implementation, and Sustainment (EPIS; Aarons et al., 2011) framework, key OIC constructs include implementation-specific leadership, strategic implementation climate, and implementation citizenship behavior. These organizational constructs are considered to be focused or "implementation-specific/strategic" (i.e., refers to a specific organizational or implementation goal) in contrast to more global or "general" versions of the construct (e.g., global organizational climate and culture) that, while important, are less directly focused on the strategic objective of EBP implementation. Below is a detailed discussion of general and implementation-specific leadership and climate as important constructs that characterize the school OIC and influence implementation of EBPs in schools.

**General and Implementation-Specific Leadership in Schools**
School leadership exerts an influence on the uptake, use, and sustainment of EBPs in classrooms by guiding and facilitating teachers with their implementation efforts. Leaders can positively or negatively impact the capacity to foster change and innovation and therefore are instrumental in facilitating a positive climate for innovation and positive attitudes toward EBP during implementation (Aarons, 2006; Aarons et al., 2015; Aarons & Sommerfeld, 2012). Both implementation and leadership theories emphasize the importance of leadership in supporting the implementation of innovative practices in schools. Leadership has both general and specific features as it relates to EBP implementation.

**General principal leadership (GPL).** The concept of general leadership reflects more molar or distal qualities of school principals that impact staff wellbeing and performance in a given school setting. Indeed, prior educational research has focused more on general principal management or instructional leadership (Marks & Printy, 2003) and established its links to school climate and student outcomes (Hallinger & Heck, 1996). Moreover, the literature on transformational leadership is an example of a more general focus on supporting staff autonomy and agency as it relates to their works as educators (Aarons, 2006). In addition, there is a focus on caring or positive leadership qualities that enable staff to feel like a valued and contributing member of a school organizational environment (Leithwood, Louis, Anderson, & Wahlstrom, 2004; Louis, Dretzke, & Wahlstrom, 2010). Despite the importance of these general leadership qualities, research has shown that they are not specific to or focused specifically on the task of supporting the adoption, delivery, and sustainment of EBPs. Thus, researchers have posited that general leadership qualities are necessary but insufficient to support
EBP implementation (Aarons, Ehrhart, & Farahnak, 2014; Damschroder et al., 2009; Lyon et al., 2018). Below is a discussion of existing measures of general leadership.

**Measures of general principal leadership (GPL).** Similar to many common organizational implementation context constructs, measures for principal leadership exist but are mostly multidimensional in nature. A recent review (Elliott & Clifford, 2014) identified two surveys with good psychometric properties, (a) The Comprehensive Assessment of Leadership for Learning (CALL; Camburn et al., 2012) is designed to measure the distribution of leadership tasks across both formal and informal leaders in the school. CALL is administered school-wide to all instructional staff and administrators and provides principals and other school-level leaders with feedback about the distribution of leadership in schools. It does not, however, give principal-specific feedback on performance; (b) The Vanderbilt Assessment of Leadership in Education (VAL-ED; Porter et al., 2008) measures principal performance on every 72 behaviors. These behaviors correspond to the Standards for School Leaders (CCSSO, 2008; e.g., executing a shared vision, creating a school culture conducive to student learning/staff professional growth).

Additionally, the Multi-trait Leadership Questionnaire (MLQ; Bass, & Avolio, 1995) stands out as one of the most established measures of organizational leadership. Adapted for the educational sector, the Multi-trait Leadership Questionnaire-Education (MLQ-E; Bass, & Avolio, 1995) version was specifically designed to assess general leadership qualities of principals in a given school. The MLQ consists of multiple subscales assessing two domains (a) Transformational Leadership, which was associated with a wealth of studies with performance and success in an organization as well as the
attitudes toward EBPs; (b) Transactional Leadership. The domain of transformational leadership consists of four sub-domains, including idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. The transactional leadership domain is assessed by a single subscale named “contingent reward”. However, the existing measures of principal leadership, while psychometrically sound, are too broad and non-specific to inform school leaders more strategic and focused actions as it relates to EBP implementation in schools.

**Implementation-specific leadership (SIL).** SIL is a subcomponent of general leadership that involves specific behaviors that support or inhibit implementation (Aarons et al., 2014). In this way, SIL encompasses specific leadership behaviors that are most closely tied to successful implementation (Ehrhart et al., 2014). Meta-analyses find that strategic leadership helps promote organizational change in non-school settings (Hong et al., 2013). In schools, studies indicate that support from administrators is linked to EBP implementation by school-based mental health providers (Langley et al., 2010) and teachers (Rohrbach et al., 1993), and impacts the outcomes of students participating in interventions (Kam et al., 2003).

Strategic leadership exerts its strongest impact at an interactional level. Leaders who accomplish their strategic goals communicate regularly with staff, protect time during meetings to discuss strategic content, hold staff accountable, and provide ongoing feedback based on performance (Blase & Blase, 2000; Goldring et al., 2008). In this way, SIL is comprised of a number of "embedding mechanisms" (Schein, 2010) that directly support staff use of new programs and practices. Research has shown that being proactive about implementation through planning, perseverant by sticking with an implementation
effort despite challenges, being available to discuss implementation, and prioritizing implementation all represent implementation-specific leadership behaviors that drive successful implementation (Aarons, Ehrhart, Farahnak, & Finn, 2015; Proctor et al., 2019). Indeed, school leadership has been shown to increase staff productivity and promote extra effort (i.e., citizenship behaviors; Griffith, 2004), which are essential when implementing an EBP. Thankfully, researchers have developed and validated pragmatic, technically-sound measures that capture key dimensions of SIL.

**Measures of implementation-specific leadership (SIL).** In healthcare and allied healthcare settings, leadership that supports effective implementation of EBPs is a critical determinant of implementation success. A series of seminal papers described the development, factor structure, and initial reliability and convergent and discriminant validity of a brief measure of implementation-specific leadership: the Implementation-specific leadership Scale (ILS; Aarons et al., 2014; Lyon et al., 2018). The exploratory factor analysis resulted in a 12-item scale with four subscales representing proactive leadership, knowledgeable leadership, supportive leadership, and perseverant leadership. Confirmatory factor analysis supported an a priori higher-order factor structure with subscales contributing to a single higher-order implementation-specific leadership factor. The scale demonstrated excellent estimates of reliability as well as convergent and discriminant validity evidence. The ILS is a brief and efficient measure of unit-level leadership for EBP implementation. The availability of the ILS allows researchers to assess strategic leadership for implementation in order to advance the understanding of leadership as a key aspect of the organizational context that enables implementation. The ILS also holds promise as a tool for leadership training as a method of delivering
feedback to support leaders to reflect on and plan improvements in their implementation-specific leadership behaviors to promote better EBP implementation and child outcomes (Aarons et al., 2014).

**General and Implementation-Specific Climate in Schools**

Another key aspect of a school is its climate which is often defined as "patterns of people's experiences of school life and perceptions of social norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures" (National School Climate Council, 2007, p.5). In other words, general school climate is a multidimensional construct that encompasses "virtually every aspect of the school experience" (Wang & Degol, 2015), and represent how people feel about and ultimately would describe their experiences in school. For educators and staff, their experience and perception of the school climate is comprised of the organization's molar, or general, as well as strategic, or specialized, climates such as its implementation climate.

It is important to note there has been a focus within the literature on both organizational culture and climate, with the two often being used interchangeably (Gaziel, 1997; Hoy, 1990; Van Houtte, 2005). Culture concerns values, meanings and beliefs, and ultimately the actions within an organization (e.g. school), whereas climate reflects the individual and collective perceptions of staff based on their experiences regarding how the values, meanings, beliefs and actions manifest within the organization (Owens, 1987). Therefore, climate serves as a barometer of culture and is often considered more suitable from a measurement perspective as staff perceptions can be readily assessed to determine whether they experience certain values, beliefs, and actions occurring within their organization (Gaziel, 1997; Hoy, 1990; Van Houtte, 2005). For the
purposes of this dissertation study, the focus was on measuring general and implementation-specific climate through measures of teachers’ perceptions.

**General school climate (GSC).** Organizational climate has a long history of research, with a surge in interest in the United States during the 1960s and 70s (James & Jones, 1975). Broadly defined, organizational climate describes the shared perceptions of organizational staff and personnel regarding their own status within the organization and the organization itself. When adapted to school as an organization, general school organizational climate was defined as educators’ shared perceptions of the impact of the work environment on their personal well-being, work, and behaviors.

Climate can be further narrowed to perceptions based on shared experiences. General organizational climate encompasses employees’ perceptions based on shared experiences that impact their sense of engagement and connection to their work environment (Baer & Frese, 2003; Gershon, Stone, & Bakken, 2004; James et al., 2008; Schulte, Ostroff, & Kinicki, 2006). Several primary studies have linked general climate to broad satisfaction and performance outcomes (e.g., Carr, Schmidt, Kevin Ford, & DeShon, 2003; Mehta, Atkins, & Frazier, 2013; Schulte et al., 2006). One meta-analysis demonstrated that three components of general organizational climate—cognitive, affective, and instrumental—were highly interrelated and evidenced structural relations with job satisfaction and organizational commitment (Mowday, Porter, & Steers, 1982). Applied to schools, general organizational climate is an important quality to foster for teacher job satisfaction, commitment to the school's values and mission, and keeping them engaged, but that does not necessarily reflect teacher's satisfaction or experience
with EBP implementation, nor commitment to adopting and sustaining high-quality EBP delivery (Lyon, Cook, et al., 2018; Williams et al., 2018).

**Measures of general school climate (GSC).** Although not specific to implementation, many measures of global school climate exist. A plethora of measurement tools of school climate exists in the literature and field, while most of these instruments can be found in the list managed by the National Center on Safe Supportive Learning Environments (2019). Despite the abundance of existing measures for school climate, each of them is designed specifically to tap certain aspects of the climate construct, including but not limited to: (1) academic climate (i.e., quality of the academic atmosphere), (2) community (interpersonal relationships within the school), (3) safety (physical and emotional security), (4) and institutional environment (organizational and structural features). In other words, the school climate is conceived as a multidimensional construct that covers “virtually every aspect of the school experience” (Wang & Degol, 2015). From a staff perspective, climate is also referred to as organizational health, with specific measures such as the Organizational Health Inventory used to capture staff perceptions of the schools’ organizational health with regard to five domains including institutional integrity, staff affiliation, academic emphasis, collegial leadership, and resource influence (OHI; Hoy & Feldman, 1987, 1999; Mehta et al., 2013). *Institutional integrity* assesses a school’s capacity to maintain the educational integrity of existing programs and protect teachers from detrimental demands. *Collegial leadership* measures the degree to which principals are friendly, supportive, open, and genuinely concerned with staff. *Resource influence* assesses the adequacy of supplies and instructional material available to staff, as well as the staff’s perception of the principal’s capability to
obtain additional support. *Staff affiliation* describes the collective perception of school pride, friendliness, feelings of enthusiasm and accomplishment. *Academic emphasis* collects information about the discipline and work ethics among students (Bevans, Bradshaw, Miech, & Leaf, 2007). The OHI has good internal reliability as evidenced in validation studies (e.g., Bevans et al., 2007). The above measures, however, represent general non-focused measures that are considered too broad for purposes of understanding educators’ perceptions about adopting and delivering EBPs based on their shared experiences.

**Implementation-specific climate (SIC).** Unlike general school climate, school implementation-specific climate describes staff’s perceptions based on their shared experiences specific to the expectations, supports, and rewards provided within their setting for implementing EBPs in (Williams et al., 2018). Implementation-specific climate is considered more proximal to EBP implementation outcomes than general school climate because it captures the extent to which staff in an organization perceive implementation as something that is expected, supported, and rewarded, as well as something that gets tracked and individuals are likely to receive feedback about (Ehrhart et al., 2014b; Lyon, Cook, et al., 2018; Williams et al., 2018). A school that is in active pursuit of EBP implementation provides staff with a variety of specific experiences through the policies, procedures, practices, and communication it deploys through its organizational leadership structure. It is the saliency of these actions to the workforce that determines a given setting’s implementation climate. Since climate is the aggregate of staff perceptions, staff must be able to witness these actions and internalize these actions
in order for them to impact their perceptions and feelings toward an implementation effort.

To date, researchers have linked implementation-specific climate to determinants of EBP implementation including the staff’s knowledge of, belief in, and positive attitudes toward an EBP (Williams et al., 2018). Although grounded within the EPIS model, implementation-specific climate is still in need of research to examine how it operates with other organizational factors to impact individual implementers and corresponding implementation and student outcomes (Weiner, Belden, Bergmire, & Johnston, 2011). In addition, this work needs to be done within varied contexts and service delivery sectors, including schools, to determine how well implementation-specific climate describes these environments and influences implementation outcomes. Psychometrically sound measures of school implementation-specific climate provide opportunities for this type of research to occur.

**Measures of implementation-specific climate (SIC).** Although well-established measures of broad school climate exist within the broad psychology literature (You, O'Malley, & Furlong, 2014), their usability regarding implementation-specific climate is limited. School implementation-specific climate must be directly assessed. Recently, researchers adapted the implementation-specific climate Scale (ICS; Ehrhart et al., 2014), originally developed for and tested on clinicians within community mental health agencies, to the school context (Lyon et al., 2018). The ICS is a very brief (18 item) and pragmatic measure of a strategic climate for EBP implementation. It captures six dimensions of the organizational context that indicate to employees the extent to which their organization prioritizes and values the successful implementation of EBPs. The ICS
can be used by researchers to better understand the role of the organizational context on implementation outcomes and by organizations to evaluate their current climate as they consider how to improve the likelihood of implementation success.

The school-adapted version of ICS developed by Lyon and his colleagues measured the degree to which the school system supported staff EBP implementation. Initial findings demonstrated a five-factor structure with a general second-order factor. Factors included Focus (i.e., if EPB implementation was a priority for the school and district), Education Support (i.e., access to training and support material), Recognition (i.e., organizational and social recognition for EBP implementation), Selection (i.e., how well the hiring process identifies new employees oriented toward EBP implementation), and Openness (i.e., adaptability and cognitive flexibility of staff). The adapted ICS demonstrated strong psychometric properties as evidence by internal consistency estimates and associations with other measures.

**Differential Associations of Organizational Factors and Universal EBPs**

The magnitude of associations between general and implementation-specific organizational factors may differ depending on the type of universal EBPs, as some are more organizationally focused school-wide efforts, and some are more classroom-focused and are dependent on teachers incorporating practices in their own classroom setting. For example, the universal level of SWPBIS is a school-wide, non-curricular approach that involves staff working together to establish, teach, model, and reinforce agreed up behavioral expectations (Horner & Sugai, 2008). Much of SWPBIS implementation occurs in non-classroom settings (e.g., rotational teaching of behavioral expectations and reinforcing expected behavior in non-classroom settings). In fact, the gold standard
metric of SWPBIS—the Tiered Fidelity Inventory (TFI; Algozzine et al., 2014)—represents a school-level index that captures the degree to which core components are being implemented as planned across settings and people within the school. On the other hand, social-emotional learning curriculum, such as the Promoting Alternative Thinking Strategies (PATHS; Conduct Problems Prevention Research Group, 2010), is a curricular approach that involves individual teachers’ choosing to adopt and deliver a manualized curriculum and using effective instructional strategies to promote skill acquisition and generalization of skills beyond the lesson. Given the differences between the types of EBPs, it is plausible that organizational factors may be differentially associated with implementation outcomes depending on the type of universal EBP, with EBPs emphasizing more of a school-wide approach being more strongly associated with organizational factors than those that are more classroom-focused.

**Organizational Factors are Necessary but Insufficient to Facilitate Implementation**

Although organizational factors associated with the setting in which implementation happens creates the environmental conditions conducive for implementation, characteristics of the implementers who are expected to adopt and delivery EBPs that also matter. Consistent with several widely used implementation frameworks (e.g., Exploration, Preparation, Implementation, and Sustainment; Aarons, Hurlburt, & Horwitz, 2011), individual-level characteristics of those who are ultimately expected to implement the EBP represent important determinants of implementation success. Therefore, to better understand the factors that influence implementation, it is important to also investigate individual-level factors (e.g. attitudes toward EBPs) that are
associated with school-based implementation outcomes and how they associated with organizational factors associated with a given school setting.

**Attitudes toward EBPs as a Pivotal Individual-Level Factor**

Variation in individual-level implementation is found regardless of whether implementers work in settings with optimal organizational factors in place (e.g., supportive leadership) or receive adequate implementation supports (e.g., quality training and coaching support; Kincaid, Childs, Blase, & Wallace, 2007; Sanford DeRousie & Bierman, 2012). Therefore, addressing individual-level factors (consisting of barriers or facilitators to implementation) is critical to the facilitation of implementers’ delivery of EBPs (Low, Smolkowski, & Cook, 2016). In schools, teachers usually serve as the primary implementers of most school-based evidence-based programs, given their abundant time spent and close contact with students as well as responsibilities to manage student behaviors while running a classroom (Han and Weiss 2005). As such, teachers play an instrumental role in determining whether an EBP is ultimately adopted, properly implemented (e.g. with acceptable fidelity), and demonstrates success in enhancing positive student outcomes (e.g., improved academic engagement and performance, reductions in disruptive behavior; Battistich et al. 2004; Dusenbury et al. 2003; Games et al. 2002; Lillehoj et al. 2004). However, in natural education conditions outside of controlled research, there is significant variation among teachers in their adoption and delivery of new practices (Abry, Rimm-Kaufman, Larsen, & Brewer, 2013; Goncy, Sutherland, Farrell, Sullivan, & Doyle, 2015). Therefore, it is critical for implementation activities designed to facilitate the adoption and use of EBPs in schools to focus on
individual-level factors of teachers that either facilitate or impede the efforts and process of implementation of EBPs.

Current literature in fields outside of educational psychology has identified and established an array of individual-level factors, including attitudes, self-efficacy, stress/burnout, and organizational commitment, that may be linked to implementation (Cook et al., 2018; Larson, Cook, Fiat, & Lyon, 2018; Webb & Sheeran, 2008; Wieber, Odenthal, & Gollwitzer, 2010). Teachers consist of a heterogeneous group of implementers who vary according to their motivation (extrinsic and intrinsic) as well as the internal capacity to adopt and embed new EBPs as part of their classroom management routines (Dickie et al., 2014; Domitrovich et al., 2015). Variation in motivation is proven to result in differences in teachers’ intentions to implement (i.e., willingness and commitment to implement a given practice) and their actual adoption and use of new practices in schools (Glanz & Bishop, 2010).

Moreover, how teachers think and feel about adopting and delivering new practices (i.e. their attitudes toward EBPs), plays an instrumental role in determining whether they will adopt and deliver an EBP with fidelity, which is a key prerequisite for successful implementation (Battistich, Schaps, & Wilson, 2004; Dusenbury et al. 2003; Lillehoj, Griffin, & Spoth, 2004). Attitudes are defined as a person’s evaluative judgments rooted in the integration of specific behavioral beliefs that can impact a person's ambivalence, resistance, and motivation to execute certain actions. For example, beliefs about the anticipated benefits, or lack thereof, of a given action are likely to influence the person’s overall evaluative judgment regarding the action (Crano & Prislin, 2006; Erwin, 2014; Petty, 2018). When applying attitudes to EBP implementation,
attitudes reflect implementers’ favorable or unfavorable evaluative judgment regarding the implementation of a given EBP, which in turn is hypothesized to impact their implementation intentions and behaviors (i.e., fidelity).

Teachers’ attitudes toward EBPs may influence the implementation of EBPs at many stages of an implementation process. First, in general, teachers’ attitudes toward EBPs serve as a precursor to adoption as it impacts whether or not they are “bought in.” Second, if teachers do initial implementation by adopting an EBP, their attitudes can impact their decisions regarding whether they will follow through with delivering the EBP with fidelity and ultimately sustaining its implementations once supports are withdrawn (Aarons, 2005; Candel & Pennings, 1999; Frambach & Schillewaert, 2002; Rogers, 1995). Third, attitudes are subject to change due to life or work experience, and it is critical to be able to measure and capture these changes over time to determine whether staff maintain favorable attitudes toward a given EBP implementation effort (Rydell & McConnell, 2006).

The view that the beliefs and attitudes of implementers are likely to influence the uptake and use of EBPs is supported by an increasing body of evidence (Nelson & Steele, 2007). Among educational researchers specifically, teachers (who are usually end implementers of EBPs) beliefs and attitudes have been argued to be a prerequisite to change efforts within schools (Guskey, 1986). Both qualitative and quantitative researchers support the view that teachers’ attitudes toward certain practices and their own professional roles are likely to influence the successful implementation of EBPs (Bowden, Lanning, Pippin, & Tanner, 2003; Parcel, O’Hara-Tompkins, Harrist, & Basen-Engquist, 1995). For example, teacher attitudes have been shown to correlate with
School-Wide Positive Behavior Interventions and Supports (SWPBIS) intervention fidelity (Kincaid et al., 2007) and their willingness to adopt and deliver social-emotional learning (SEL) curricula (Brackett, Reyes, Rivers, Elbertson, & Salovey, 2012). Moreover, educators who possess beliefs and attitudes about specific components of EBPs are detrimental to students (e.g., that extrinsic reinforcement), which is a key component of SWPBIS and some SEL programs, harms intrinsic motivation) are prone to possess little intention to implement those EBPs in their schools (Maag, 2001).

Teacher attitudes exist within an inner organizational context (i.e. school as a microsystem) that is influenced by other factors such as policies, leadership, and climate. Specifically, multiple aspects of the OIC (i.e., the settings and co-workers involved in implementation efforts) have been hypothesized to influence individual-level factors (e.g. teachers’ attitudes) which in turn impact critical implementation outcomes throughout the entire implementation process, such as adoption, fidelity, sustainment, and reach/filtration (Proctor et al. 2011). The OIC constructs include but not limited to organizational climate—defined as personnel’s perceptions of, and emotional reactions to, the characteristics of their work setting (Aarons & Sawitzky, 2006), and principal leadership (Elias et al., 1997). At the same time, teachers’ attitudes are also considered to have a unique direct influence on implementation behavior. Therefore, in research and practice, attitudes should be treated as potential process variables through which organizational factors impact implementation outcomes, as well as the unique individual-level factors that influence implementer implementation decisions and behavior. From this perspective, implementation outcomes can be increased by improving implementation-specific organizational factors (e.g., implementation-specific leadership


and implementation climate) and promoting educators’ positive attitudes toward EBP directly or indirectly via influencing organizational implementation context factors (Han & Weiss, 2005; Forman et al., 2013).

Indeed, teachers’ attitudes can be influenced by the inner organizational factors (e.g., organizational climate, principal leadership) within a given setting. However, it remains unclear about what specific aspects of the OIC are most strongly associated with teachers’ attitudes toward EBPs, and whether attitudes serve as a mechanism through which organizational factors influence implementation outcomes. Therefore, there is a need for research that investigates the cross-level associations between organizational factors, such as implementation-specific leadership and climate, and individual-level educators’ attitudes and how these cross-level interplay impact implementation outcomes in schools.

**Theoretical Basis for Attitude as a Pivotal Individual-Level Implementation Factor**

The emergence of applied social-cognitive research generated the theoretical basis for the role of attitudes in influencing professional’s implementation behaviors, motivation, and intentions. Social-cognitive psychology depicts the interactive social and cognitive processes that inform behavioral decision making by investigating how professional’s actions are influenced by the way they perceive themselves, the attitudes they hold toward certain behaviors in question, as well as the social context in which they reside (Bandura, 2004). Built from those social-cognitive findings, applied social-cognitive interventions target these basic motives to produce changes in individuals' perceptions and behavior as it relates to important outcomes, such as health or job performance (Steinmetz et al., 2016). In the context of implementation science, strategies
informed by social-cognitive theory have the potential to alter teachers’ attitudes and behaviors regarding their implementation of EBPs in the school context. Real-life examples include strategies that promote teachers’ actively acquiring knowledge about them (i.e., professional development) and receiving feedback to deliver them with improved fidelity (i.e., consultative supports; Cook, Lyon, Kubergovic, Browning Wright, & Zhang, 2015).

In school-based implementation research, social-cognitive theories help with the explanation of the underlying mechanism of why and how the individual-level implementation factors impact teachers' motivation and intentions to adopt and deliver new practices and programs. For instance, the social-cognitive theory suggests that teachers’ behavioral intentions are malleable constructs that impact motivation to change (Ajzen & Manstead, 2007; Cialdini & Goldstein, 2014; Yeager & Walton, 2011). The Theory of Planned Behavior (TPB; Ajzen, 1991, 1985; Fishbein & Ajzen, 1975) is a widely established social-cognitive theory that has been used to predict and target behavior change (Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008). For example, the TPB includes individual-level factors that predict and explain changes in human behavior within specific contexts (Ajzen & Manstead, 2007). The central tenet of the TPB is that one of the best predictors of behavior is a person’s behavioral intention, which “capture the motivational factors that influence behavior, they are indicators of how hard people are willing to try, of how much effort they are planning to exert, in order to perform the behavior” (Ajzen & Manstead, 2007, p. 181). Behavioral intention, in turn, is a function of an individual’s attitudes (i.e., an individual’s cognitive appraisals of a specific set of behaviors conditioned on his/her beliefs), subjective norms (i.e., an individual’s own
perceptions and estimate of the social pressure and expectations to perform a given set of behaviors), and perceived behavioral control (i.e., an individual’s confidence or self-efficacy about being able to perform specific behaviors).

According to the TPB, for a successful implementation of an EBP, teachers need to have enhanced intentions to implement which were conducive to favorable beliefs and attitudes toward the program and practice, perceive that implementation of the EBP is what people they trust and respect are doing (i.e., social expectations, conformity, and/or pressure), and believe in their own capability to adopt and deliver the practice in the face of other competing demands (Eccles et al., 2007). For instance, a longitudinal study conducted with teachers supporting students with autism revealed that, following in-service training, teachers endorsing high intentions to implement were five times more likely to adopt and implement EBPs than those endorsing low intentions to implement (Fishman, Beidas, Reisinger, & Mandell, 2018). What’s more, a preliminary study based on the TPB designed and utilized implementation interventions targeting teachers’ attitudes and beliefs toward EBPs which in turn enhanced their intentions to implement. The findings indicated that changes in teachers’ intentions to implement driven in part by supportive attitudes are significantly associated with improved implementation in the active implementation stage when EBP uptake and use are critical (Cook, Lyon, Kubergovic, Wright, & Zhang, 2015). Teacher attitudes toward EBPs have also been shown to be associated with implementation fidelity (Brackett et al., 2012; Lohrmann et al., 2008). As such, implementation strategies targeting teachers’ attitudes toward EBPs, which in turn enhanced their intentions to implement, prior to initiating implementation of an EBP may serve as an effective approach to result in better implementation and
student outcomes through the means of improved fidelity as well as teachers’ responsiveness to training and system supports. What’s more, despite the promise of those research on implementation enhancing interventions targeting on altering teachers’ attitudes, there is still vacancy in the literature pronounced by these authors about the mechanism of how teachers’ attitudes are influenced and interact with inner organizational contextual factors in schools, which is a prerequisite for scaling-up of school-wide implementation enhancement interventions.

Measurement of Attitudes toward EBPs

As aforementioned, attitudes toward EBPs surfaced as a promising individual level implementation factor that is malleable and conducive to improved implementation and student outcomes. Before designing interventions targeting on the alteration of Attitudes toward EBPs, there is a pending need for psychometrically validated instruments measuring the quantity and quality of teachers’ attitudes toward EBPs based on social-cognitive theories, which can guide the evaluation and appraisal of intervention effects.

Aarons (2004) developed a 50-item measure designed to assess different dimensions of provider attitudes as it relates to the implementation of EBPs (Aarons, 2004). Developed initially in the context of EBP implementation in community-based mental health settings, the Evidence-Based Practice Attitudes Scale (EBPAS) was developed and validated which includes four subscales that capture distinct yet inter-correlated structural components of mental health service providers’ attitudes toward EBPs (Aarons, 2004). These subscales include (1) EBP Appeal (i.e., willingness to adopt EBPs given their intuitive appeal); (2) Required (i.e., willingness to adopt new practices
if required); (3) Openness (i.e., general openness toward new or innovative practices); and (4) Divergence (i.e., perceived divergence of usual practice with academically developed or research-based practices) (Aarons, 2005). Expanding from the original study, the EBPAS has been tested and validated extensively in implementation research across different contexts and providers (Aarons, 2006a; Rye, Torres, Friborg, Skre, & Aarons, 2017). One such study represented a national validation study with over 1000 mental health service providers from over a hundred different community-based mental health service delivery settings across twenty-six states in the U.S. (Aarons et al., 2010). The large-scale study yielded supportive results for the EBPAS’ second-order factor structure (i.e., four sub-factors contributing to one general attitude factor) and psychometrically adequate reliability estimates for each subscale and the total scale.

Similar to prior research, the results of the large-scale study revealed that the Divergence subscale demonstrates the least variability and lowest internal consistency ($\alpha = .63$), while the “requirement” subscale holds the most variability and highest internal consistency ($\alpha = .96$). This finding implies that there are variations in the psychometric properties of the subscales measured by EBPAS. Moreover, when considering the Divergence subscale in the context of social-cognitive theory, it is less consistent with prior theory and approaches to measuring attitudes than the other EBPAS subscales. Therefore, future studies using the EBPAS should adopt an elective approach to strategically select the subscales of EBPAS based on theory and empirical decision rules rather than treat the EBPAS as a unitary construct that produces a total score for inclusion in analyses. Such an approach will remove potential construct irrelevant variance that may attenuate or suppress relationships with other variables of interest.
There is a trend among researchers that attempt to gauge the extent to which the findings and measurement products of existing implementation research, such as the EBPAS, can generalize to other settings (e.g., EBPAS in the educational sector). Cross-validation in different settings is instrumental to amplify the multi-disciplinary nature of the field of implementation science by determining if specific constructs and their corresponding instruments are context-dependent or -independent. For instance, despite the extensive body of research on the EBPAS and its established potential to guide both implementation research and practice in many fields, psychometric findings of the factor structures and criterion validity evidence of EBPAS were still absent in the school setting.

**Measurement of educators’ attitudes toward EBPs.** As a common service provision setting where students naturally reside, schools offer unique advantages to promote students’ behavioral and mental health given that over 70% of youth who receive psychological services in the USA do so in schools (Burns et al., 1995; Farmer et al., 2003). However, psychological and behavioral health services delivered in schools often are not evidence-based nor delivered with sufficient fidelity, resulting in a significant waste of resources (e.g., funds invested in the research) and a missed opportunity to promote public health outcomes (Gottfredson & Gottfredson, 2002; Owens et al., 2014; Rones & Hoagwood, 2000). Most schools have a diverse pool of on-site professionals who can support the delivery of psychological and behavioral health services (Owens et al., 2014). Favorable attitudes held by those professionals toward school-based EBPs are critical factors for expected implementation outcomes, especially
for fidelity. However, there is limited research investigating the relationship between educators’ attitudes toward EBPs as measured by EBPAS and fidelity of EBPs in schools.

A recently published article by a group of school-based implementation researchers attempted to fill this gap in the literature. They took a unique perspective on a common but often overlooked group of school professionals -- school-based behavioral health consultants who frequently operate as intermediaries in the implementation process (Cook et al., 2018). The findings of the confirmatory factor analyses in this study were generally consistent with the second-order factor structure and psychometrics established in the original study in a sample of public sector mental health providers (Aarons, 2004). Coefficient alphas demonstrated strong internal consistency among the subscales and total scale. Also, the study extended evidence on the external validity of the EBPAS by not only demonstrating its reliability and validity in the context of school-based implementation but also to a different group of school professionals involved in the implementation process (i.e., consultants).

Notwithstanding the prior evidence in support of the psychometric properties of the EBPAS, it is important to explore the different subscales and attitudinal dimensions they attempt to measure in the context of theory and existing evidence to identify which ones may be most suitable and defensible for inclusion in implementation research that seeks to examine the cross-level interactions between organizational factors and individual-level characteristics of implementers. For example, although prior research has demonstrated a second-order solution with four first-order factors and one second-order factor reflecting general attitudes toward EBPs, existing evidence suggests that the Divergence sub-scale is likely to have weaker inter-correlations with other factors and
reduced variability (Cook et al., 2018). Moreover, from a theoretical standpoint, EBP Appeal and Openness are more consistent with established social-cognitive theories of attitudes that conceive attitudes as evaluative judgments associated with specific behavioral beliefs and person’s ambivalence, resistance, and motivation. For instance, supportive beliefs about the anticipated benefits, or lack thereof, of a given EBP are likely to influence the person's overall evaluative judgment (i.e. attitude) toward the EBPs. Last, all the above suggest that treating attitudes as a unitary construct potentially may introduce construct-irrelevant variance into analyses that attenuate relationships and washes over more nuanced findings regarding the specific dimensions of attitudes that are more or less associated with organizational factors and implementation outcomes.

Despite the ongoing research activities in validating EBAPS in the education sector (e.g., Cook et al., 2018), specific measurement of teachers’ attitudes toward EBPs in the context of real-world implementation efforts in schools is missing. Moreover, there is a limited understanding of how attitudes toward EBPs relates to organizational factors to impact school-level implementation outcomes, such as fidelity.

**Gaps in Extant Literature**

A collection of relevant measurement tools have been developed and validated to capture key implementation organizational or individual-level constructs, some of which have been adapted to the school-specific population and settings (Briesch et al., 2013; Lyon, Cook, et al., 2018; Owens et al., 2014; White, 2008). There remains, however, significant gaps to be addressed via research to develop a better understanding of OIC factors that relate to individual-level implementer characteristics, such as attitudes toward EBP, and implementation of universal SEB EBPs.
Specifically, there are several gaps in the existing literature that warrants continued research that explores the associations between school-level organizational factors, teachers’ attitudes toward EBPs, and implementation outcomes. First, there has been limited research examining to what extent and how general and implementation-specific organizational factors, such as leadership and climate, are associated with one another in relation to specific dimensions of teachers’ attitudes toward EBPs or attitudes as a whole. Second, only a few studies to date have examined the interaction between general and implementation-specific organizational factors on individual-level characteristics of implementers (e.g., Kam, Greenberg, & Walls, 2003). This is important as researchers have suggested that the association between implementation-specific and individual-level factors (e.g., implementation-specific leadership and teachers’ attitudes toward EBPs) depends on general leadership qualities (Aarons, Ehrhart, Farahnak, & Hurlburt, 2015b; Ehrhart, Aarons, & Farahnak, 2014b; Lyon, Whitaker, et al., 2018). For example, site leaders who are viewed as kind, good listeners, and supportive and who exhibit implementation-specific leadership behaviors are more likely to influence certain malleable individual-level characteristics of implementers, such as teachers’ attitudes toward EBPs, than leaders who possess only general leadership qualities or implementation-specific leadership alone.

Third, it is unclear whether teacher attitudes toward EBPs serve as a potential mechanism through which school organizational factors influence implementation outcomes. Theory would suggest that attitudes may serve as a potential social-cognitive mediator between organizational factors and implementation behavior (e.g., fidelity). However, this remains an untested hypothesis. Fourth, based on extant implementation
literature, the characteristics of a given EBP (e.g. core components included, intended delivery method, and level of implementation) may impact the relationship between implementation outcomes and organizational factors (Fixsen et al., 2005; Damschroder et al., 2009; Alexis Kirk et al., 2016). For example, school-wide approaches such as the universal level of SWPBIS may be more related to organizational factors than classroom-based approaches like a social-emotional learning curriculum that emphasize teachers’ altering how they deliver instruction in the classroom. However, it is unclear whether organizational factors and teachers’ attitudes toward EBPs are differentially associated with implementation outcomes depending on the type of universal EBPs (e.g., school-wide versus classroom-focused).

Collectively, the above gaps leave room for research to advance understanding within the field regarding the relationships between general and implementation-specific organizational factors, teachers’ attitudes toward EBPs, and implementation of universal EBPs.

**Purpose of the Current Study**

To address the current gaps in research, this study used secondary data from a larger scale measurement validation study to explore relationships among general and specific organizational factors, teachers’ attitudes toward EBPs, and implementation. This study had three general purposes that informed specific research questions: (a) examine cross-level associations between general and implementation-specific leadership and climate and teachers’ attitudes toward EBPs; (b) explore whether the interaction between general and implementation-specific leadership and climate better explains variance in teachers’ attitudes toward EBPs; and (c) whether teachers’ attitudes toward
EBPs mediate the relationship between general and specific implementation-specific leadership/climate and implementation outcomes (i.e., fidelity). The four research questions addressed in this study were:

**RQ1.** At both school- and individual-level, to what extent are general and implementation-specific leadership and climate associated with different dimensions of teachers’ attitudes toward EBPs after controlling for school- and individual-level covariates?

**RQ 2.** Based on significant findings from RQ1, to what extent do general and implementation-specific leadership or climate interact to explain variance in specific dimensions of individual-level teacher attitudes toward EBPs above and beyond each of the variables alone?

**RQ3.** To what extent do general and implementation-specific factors (leadership and climate) and specific dimensions of teachers’ attitudes of EBPs relate to the implementation outcome of universal EBPs (i.e., PATHS and SWPBIS, respectively)? Do the observed relationships vary by the type of universal EBP (i.e., PATHS versus SWPBIS)?

**RQ4.** Expanding from the significant findings in RQ3, do specific dimensions of teachers’ attitudes toward EBP mediate the relationship between school organizational factors and the implementation of a universal EBP (i.e., SWPBIS or PATHS fidelity)? Does the mediational effect of teachers’ attitudes toward EBP differ depending on the type of universal EBP (i.e., SWPBIS versus PATHS)?

**Chapter 3: Method**

**Data Source**
The current study involved conducting secondary data analysis using a dataset from a large-scale federally funded measurement project focused on developing and validating a suite of measures that assess key determinants of successful implementation. Prior to obtaining data for this study, all identifiable information was removed, and data were shared with a secure online data storage system. The current study involved developing novel research questions that went beyond those proposed as part of the original grant.

Setting and Participants of the Analytic Sample

School-level demographics. A variety of urban public schools were recruited for participation in a large-scale federal research grant. Eligible schools were selected based on their current active implementation status of an evidence-based universal prevention program (school-wide positive behavior intervention and supports $n_{school} = 39, n_{teacher} = 348$; PATHS social-emotional learning curriculum $n_{school} = 13, n_{teacher} = 93$). The final sample included 441 teachers from 52 elementary schools in six large urban school districts across three states on West-Coast and Mid-West. Participating schools were racially/ethnically and socioeconomically diverse ($M_{Percentage \ of \ Non-White} = 16\%; \ minimum = .8\%, \ maximum = 100\%; \ M_{Percentage \ of \ free \ and \ reduced-priced \ lunch} = 15.1\%; \ minimum = 3\%, \ maximum = 47.1\%). For details of school-level demographics in the dataset, please see Table 1.

Teacher-level demographics. An average of eight teachers per school was recruited to complete several measures of the organizational implementation contextual factors and attitude measures. Eighty-nine percent of the respondents identified as female and 11% as male. Most respondents (84%) identified their race/ethnicity as White/non-
Hispanic, followed by 5% Black or African American, 5% Multiracial, and 6% Other. The most commonly held highest-degree-earned was a master’s degree (68% of respondents), with the remaining participants having a bachelor’s (32%) or doctoral degree (1%). Five percent of respondents were between 18 and 24 years of age, 29% were 25–34, 28% were 35–44, 24% were 45–54, 14% were 55–64, and 1% were 65-74. The average number of years the participating teachers have worked in their current profession was 11.6 (SD = 7.0 years; minimum = 1 year, maximum = 20 years). Additionally, the average number of years the participating teachers spent in the current school is 6.94 (SD = 5.99 years; minimum = 1 year, maximum = 20 years). Due to missing data (< 5% overall), the number of participants included in some analyses was less than 441. The method to handle missingness in the dataset is reported in the Data Analytic Plan section. Complete demographic information for participants is shown in Table 2.

**Procedures**

This study occurred as part of a large-scale federally funded measurement project creating school-based tools for all OIC constructs. Prior to conducting validation studies, the measures underwent a series of revisions to adapt them for use in schools by increasing the relevance, fit, and acceptability of each of the measures and their corresponding sub-constructs and items. The measures and constructs were adapted first via an expert summit and then through hosting mixed-method focus group sessions with key educator stakeholder groups (Locke et al., 2018). Following each of these measures was adapted in preparation for the validation studies that focused on examining the construct validity and perceived utility of the school-adapted measures. Adaptations
consisted of changing item wording to ensure construct equivalence for the target respondents (i.e., school-based practitioners) and deleting and expanding item content-based to ensure contextual appropriateness to the school context (Hambleton, 1996). An effort was made to preserve the integrity of the original items and constructs while ensuring appropriateness to the school context (Hambleton, Merenda, & Spielberger, 2005). Thus, all items from the original scales were maintained with changes only made to item wording, such as replacing the word “supervisor” with “school administrator,” “clinician” with “school personnel,” and “agency” with “school.” Moreover, the expansion of the measures was made based on feedback from experts and stakeholders regarding sub-constructs missing from the original measures that are relevant and have utility in the school context. For example, for the School-Implementation-specific climate Scale, three additional sub-scales were included in the S-ICS based on information gleaned from experts and/or stakeholders: (a) Use of Data, (b) Existing Supports to Deliver EBP and (c) EBP Integration (see Measures section below for definition of each of these sub-constructs). Moreover, for the School-Implementation-specific leadership Scale (S-ILS) two additional sub-scales were generated.

Human subject approval was obtained from the University of Washington IRB and partnering school districts’ research and evaluation departments. Schools were recruited if they were actively implementing SWPBIS or the PATHS social-emotional learning curriculum for universal prevention and promotion. Schools had to receive training and follow-up support for at least a year for consideration for inclusion in this study. Once a pool of candidate schools was identified, they were randomly selected and recruited for participation. This inclusion criterion was made based on the ability to
measure certain implementation outcomes such as fidelity and reach which are only permissible during the active implementation phase (Proctor et al., 2011).

The initial random sample and selection of schools involved working with central administrators and communicating with site-based administrators regarding the project’s benefits and data collection procedures. School administrators or an appointed liaison from partnering schools then randomly recruited 5-10 teachers to participate in data collection. Selecting a random sample of at least 3 employees from a given organization has been shown to be a reliable and valid approach to measuring organizational constructs (Glick, 1985). It is important to note that the random sampling of schools and teachers within schools to complete measures met assumptions for performing multilevel analysis because it enables one to generalize findings based on the random sampling distribution at both level 1 and 2 populations. Contact information was obtained from teachers for research staff to contact them and send them a link to the survey.

To facilitate data collection, a web-based survey was constructed using the Qualtrics system. Data were collected at two time-points (Fall and Spring) during the 2017-2018 academic year. An initial email was sent to teachers in November to provide them with an overview of the project, obtain informed consent, and provide a link to the online survey. Each school was provided with a one-month window to complete the survey from the time they were sent the initial email. Reminder emails were sent on a weekly basis to increase the number of respondents from each school. Only the Fall data were used for the purposes of conducting confirmatory analyses and examining convergent and divergent validity.

Besides the school- and individual-level data collected via the Qualtrics system,
the fidelity data in the current study were collected via two independent EBP purveyor groups. The Northwest PBIS Network gathered data on the fidelity of the universal level of SWPBIS using the Tiered Fidelity Inventory (TFI). The PATHS fidelity ratings were completed by trained observers from the PATHS Education Worldwide group, which is the purveyor of PATHS who is responsible for delivering training, follow-up consultation, and fidelity audits. Two waves of data were obtained for SWPBIS in fall and spring, while only data were gathered for PATHS in the fall due to issues with recruiting and scheduling data collection in PATHS schools. To create a common unit of analysis between the fidelity measures of the two universal EBPs, the PATHS fidelity ratings at the teacher classroom-level were aggregated to the school-level to create a school-level index indicating the average percentage of core components adhered to by teachers in a given school. This was then combined with the SWPBIS which also provides a percentage index representing the proportion of fidelity points earned across core components.

**Measures**

**School- and teacher-level demographic covariates.** To eliminate potential confounding effects and optimize statistical power, a set of demographic covariates at the school- and teacher-level were selected to enter the analytic models, which are theoretically relevant to the research questions and commonly used in educational or implementation research. The demographic covariates were collected via either administrative data reported by the participating schools or the first section of the web-based survey using the Qualtrics system. The demographic covariates include school enrollment size (binned into five categories with equal percentile for each based on the
distribution of the enrollment variable in the analytic sample), indicators of school-level student diversity (percentages of non-white students, students in the English Language Learning program, and Free-/Reduced-Priced Lunch program), and teacher-level variables (age, gender, grade taught, practice settings, and teaching experience). Please refer to Tables 1 and 2 for detailed descriptive information of the demographic covariates initially included in the analysis.

**General leadership measure.** The Multi-trait Leadership Questionnaire-Education (MLQ-E; Bass, & Avolio, 1995) version was used to assess general leadership qualities of principals in each of the participating schools. The MLQ stands out as one of the most established measures of organizational leadership. The MLQ-E was the specific version adapted for the educational sector. The MLQ consists of multiple subscales assessing two domains (a) Transformational Leadership, which was associated with a wealth of studies with performance and success in an organization as well as the attitudes toward EBPs; (b) Transactional Leadership. The items in the MLQ-E were rated on a 4-point Likert scale ranging from 0 (“not at all”) to 4 (“frequently, if not always”). The domain of transformational leadership consists of four subscales: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. The transactional leadership domain is assessed by a single subscale named “contingent reward”. The MLQ has demonstrated acceptable psychometric properties in prior studies with regard to its internal consistency reliability (Cronbach alphas ranging from .87 to .91), as well as adequate evidence for concurrent and predictive validity (Aarons, 2006; Bass, & Avolio, 1995). For details about MLQ-E, see Appendix A.

**Implementation-specific leadership measure.** School-Implementation-specific
leadership Scale (S-ILS) was adapted from the original Implementation-specific leadership Scale (ILS; Aarons et al., 2014). The original Implementation-specific leadership Scale has twelve items load onto four subscales: Proactive Leadership (anticipating and addressing implementation challenges), Knowledgeable Leadership (deep understanding of EBP and implementation issues), Supportive Leadership (support for EBP adoption/use), and Perseverant Leadership (leader is consistent, unwavering, and responsive to challenges). Subscale internal consistencies ranged from 0.95 to 0.98. The ILS subscale scores correlated moderately with other leadership measures and demonstrated discriminant validity from aspects of general organizational climate. For details about ILS, see Appendix B.

**General climate measure.** The Organizational Health Inventory for Elementary Schools (OHI-E; Hoy & Tarter, 1997) was administered as a molar climate measure that captures the health and climate of a school based on the perception of the school staff. The OHI-E has 5 subscales: institutional integrity, staff affiliation, academic emphasis, collegial leadership, and resource influence. The OHI consists of 37 items that measure the five aspects of a healthy functioning school: institutional integrity (the school’s ability to cope successfully with destructive outside forces; teachers are protected from unreasonable community and parental demands), staff affiliation (warm and friendly interactions, positive feelings about colleagues, commitment to students, trust and confidence among the staff, and sense of accomplishment), academic emphasis (students are cooperative in the classroom, respectful of other students who get good grades, and are driven to improve their skills), collegial leadership (principal’s behavior is friendly, supportive, open, egalitarian, and neither directive nor restrictive), and resource influence
(principal’s ability to lobby for resources for the school and positively influence the allocation of district resources). The OHI-E has demonstrated acceptable internal consistency and stability in prior research (e.g., Bevans, Bradshaw, Miech, & Leaf, 2007). In this study, Cronbach alphas for the OHI-E subscales were also found to be acceptable, ranging from .84 - .94. For details about OHI-E, see Appendix C.

**Implementation-specific climate measure.** The School-Implementation-specific Climate Scale was adapted from the original ICS. The ICS was originally developed to assess the degree to which there an organization possesses an implementation-specific climate supportive of translating EBPs into routine practice (Ehrhart, Torres, Wright, & Martinez, 2016). Thirty-eight items were initially developed and evaluated based on the development process described above. All ICS items are scored on a five-point, 0 (“not at all”) to 4 (“very great extent”) scale. Previous EFAs and CFAs support six factors that fall under a unitary implementation-specific climate construct: focus on EBP, educational support for EBP, recognition for EBP, rewards for EBP, selection for EBP, and selection for openness, with subscale internal consistency ranging from .81 to .91. In the original development studies, ICS items were reduced from 38 to 18, with three items representing each sub-scale (Ehrhart et al., 2014) to minimize administration time while protecting against measurement error for latent variables (Maruyama, 1997). For this study, an additional three sub-scales were constructed based on feedback from experts and educational stakeholders: (a) Use of Data, (b) Existing Supports to Deliver EBP, and (c) EBP Integration. Four items were developed based on feedback from experts and stakeholders to represent the Use of Data and EBP Integration sub-scales and three items from the Existing Support to Deliver EBP subs-scales. This resulted in a 29-item ICS
measure. Preliminary studies have established strong reliability and validity evidence. ICS was found to be moderately correlated with a conceptually similar strategic climate measures (e.g., service climate) but only weakly correlated with measures of general organization climate. Cronbach alphas for the ICS subscales range from .81 to .91 (Aarons et al., 2012; Ehrhart et al., 2014). For details about ICS, see Appendix D.

Evidence-Based Practice Attitude Scale (EBPAS). The original EBPAS was developed to assess the degree to which providers possess favorable attitudes toward the adoption and delivery of EBPs (Aarons, 2006; Rye, Torres, Friborg, Skre, & Aarons, 2017). The original scale includes a total of 15 items capturing four subscales: Appeal, Requirements, Openness, and Divergence. The Requirements subscale includes three items while the other three subscales include four items each. An additional item was included under the Requirements subscale to capture attitudes toward EBP if “required by the school district.” The Divergence scale was reversed scored so higher scores corresponded to more favorable attitudes like the other scales. Respondents rated each item on a 5-point Likert scale ranging from 1 (“Not at all”) to 5 (“Very Great Extent”). Additional items were included in the school-adapted version to generate two additional subscales measuring Perceived EBP Burden and Perceived EBP Fit. Research has established adequate internal consistency reliability as well as convergent and discriminant validity of EBPAS (Cook et al., 2018). Reliability estimates calculated on the sample of data in this study demonstrated acceptable internal consistency estimates, with Cronbach alphas ranging from .69-.86 (Aarons, 2006; Rye et al., 2017). For details about EBPAS, see Appendix E.

Intervention fidelity. The Tiered Fidelity Inventory (TFI) was developed as a
comprehensive and efficient tool to determine the extent to which a school is implementing SWPBIS with fidelity (Algozzine et al., 2014). The TFI is organized into three 4-Likert-type scales to evaluate SWPBIS at each tier of service delivery. Trained raters completed fidelity ratings in the 39 participating schools implementing SWPBIS. Data from the TFI is used to calculate a total score representing the quality of implementation of the universal level of SWPBIS.

To measure the fidelity of PATHS, researchers used an instrument developed and validated by the Conduct Problems Prevention Research Group (CPPR, 2010). The measure includes a series of items that trained observers rate on a 4-point Likert-scale to capture the extent to which core components are being implemented with fidelity. The ratings were completed based on direct observation of teacher behavior and interviews with teachers. The observers completing the PATHS ratings were from the PATHS Worldwide group which is the purveyor of the program and responsible for delivering training, follow-up consultation, and fidelity audits. To reach a common unit of analysis between the fidelity measures of the two universal EBPs, the PATH ratings were further aggregated to the school level in a similar way to its counterpart of SWPBIS.

To obtain a unified measure of fidelity, data were integrated between the two fidelity metrics by turning the fidelity data into a common scale representing the percentage of delivering core components of each EBP with fidelity (Dusenbury, Brannigan, Falco, & Hansen, 2003; McIntyre, Gresham, DiGennaro, & Reed, 2007).

**Data aggregation.** To ensure the theoretically appropriate alignment between the levels of the units of analysis in the models derived from the research questions, school-level aggregated values were calculated based on the individual-level values of the
measures of attitudes, general and implementation-specific leadership and climate by aggregating (i.e., group centering) individual responses to these scales. Within-school inter-rater agreement was estimated by calculation of $r_{wg(j)}$ with a uniform null distribution. These values were all above the generally accepted .70 cutoff (range = .76 to .88; Butts & Michels, 2006; James, Demaree, & Wolf, 1993). Furthermore, significant between-organization variances on these variables were calculated from analyses of variance (ANOVAs) using school ID as the independent variable and educators’ individual-level response as the dependent variable (all $p$s < .05). The results of within-school agreement and between-school variance collectively supported the appropriateness of aggregating the individual-level variables to the school-level ones. Intra-Class Correlation (ICCs) coefficients will be reported in the results section as corroborative evidence to support the school level aggregation and use of multilevel approach.

**Data Analytic Plan**

**Missing data handling.** A preliminary missing data analysis revealed that the current dataset consisted of primarily complete data across all variables and contains very limited incidences of missingness (i.e., average missingness across variables was less than 1%). The data analytic approaches used in the current study employed the list-wise deletion method and full information maximum likelihood (FIML; Dempster et al., 1977) parameter estimation to adjust for any missing data and reduce potential biases. This decision was based on (a) the list-wise deletion method being relatively less biased against pair-wise deletion (the alternative option); (b) the triviality of the missing instances (1%) in the dataset (Baraldi & Enders, 2010); (c) FIML allow for unbiased
estimates of regression coefficients and standard errors under the assumption that the missing data are missing at random (Schafer, 1997), which is realistic given that every precaution was made to ensure that participant non-response was not associated with their inclusion or omission in the study (e.g., examine patterns of missing data for potential biases in sampling design or participant recruitment).

**General pre-analysis procedure.** Before analysis, descriptive statistics (e.g. measures of central tendency and variability, percentage of missingness, and distribution statistics) were calculated for all variables and covariates included in the model building process. The descriptive statistics were further checked for evidence of the adequacy of the data for hierarchical linear analysis (for RQs 1 and 2), multiple regression (for RQ 3), and nonparametric bootstrapping analysis of mediation effect (for RQ 4) (e.g. comparable scale of measurement, random pattern of missingness, and meeting basic assumptions). Table 3 detailed the acronyms and descriptive statistics of all variables in this study.

**For RQs 1 and 2.** Prior to the model building process, there was a need to strategically limit the number of subscales from the EBPAS to include in analyses to limit the number of dependent variables in RQs 1 and 2, which in turn result in a manageable number of analytic models to be fitted and interpreted. The specific dimensions/subscales of teachers’ attitudes toward EBPs measured in EBPAS were identified based on their theoretical relevance to the research questions and the statistical adequacy of the corresponding variables in the current dataset. First, preference was given to the ones having high variability (as measured by standard deviation and range) while demonstrating significant bivariate correlations with the four organizational variables at either school- or individual-levels (i.e. school-level aggregated and/or individual
perceptions of general and implementation-specific climate and leadership). The selected subscales of EBPAS was then used as the outcome variables in RQ1 and RQ2 to investigate the differentiated associations between organizational factors and specific dimensions of teachers’ attitudes toward EBPs.

The results of preliminary descriptive and bivariate correlation analysis (see Table 4) revealed that the dimension of Divergence demonstrated the least variability (as evidenced in standard deviation and range values) and lowest internal consistency while correlating weakest with all the organizational factors ($r$ range from .14 to .21). This is consistent with the findings from previous validation studies on EBPAS (Aarons et al., 2010; Cook et al., 2018), which indicated that the Divergence consistently stood out as an unusually low functioning subscale across different populations. Therefore, it was excluded from analyses in the current study. The other three dimensions (i.e. Requirement, Openness, and EBP Appeal) all demonstrated adequate variability with a moderate level of correlations with the individual-level organizational variables ($r$ range from .23 to .45), with the dimension of Openness associated with the strongest correlations overall.

Nevertheless, previous studies which adapted and validated the EBPAS in a large school-based sample indicated that the dimension of EBP Appeal demonstrated disproportionately high degree of association with the second-order factor (the unitary construct of attitudes toward EBPs; i.e. the total score of EBPAS) as evidenced by a correlation coefficient of .94 and a factor loading of .93 (Aarons et al., 2010; Cook et al., 2018). Therefore, the unitary construct of attitudes was excluded from the subsequent analysis, while the subscale of EBP Appeal served as an outcome variable for models
built in RQ 1 and 2. This decision was made because (a) the principle of parsimony; (b) the significant overlap between the shared variance explained by the subscale of EBP Appeal and the total score of EBPAS; (c) there is no significant added-value for interpretation, explanation or intervention planning if the unitary construct of teachers’ attitudes toward EBPs was included in addition to what’s explained by the models with specific dimensions of the EBPAS.

In sum, the subscales of Requirement, Openness, and EBP Appeal were used as separate outcome variables in the multilevel models built for RQs 1 and 2, in an effort to explore and delve into the potential differential associations among specific dimensions of teachers’ attitudes toward EBPs and organizational implementation factors in the schools.

For RQs 3 and 4. Considering the potential differential effect of the type of EBPs (i.e. PATHS versus SWPBIS) on the associations between the organizational factors and fidelity of implementation, a point-biserial correlation analysis was carried out to determine the magnitude of the associations between the type of EBPs and all key variables to enter the models, including implementation-specific and general organizational factors, specific dimensions of educators’ attitudes toward EBPs, and fidelity. The results revealed the type of EBPs had generally weak yet significant correlations with implementation-specific and general organizational factors (point-biserial correlation coefficients range from .02 to .14), different dimensions of educators' attitudes (total and subscale scores; point-biserial correlation coefficients range from .04 to .19), and fidelity (point-biserial correlation coefficient = .27; for details, see Table 4).
Additionally, when examining correlations between subscales of EBPAS and fidelity of implementation, only EBP Requirement showed significant correlations with fidelity measures at both school and classroom levels (see Table 4). Therefore, only EBP Requirement will be tested as a mediator, in order to provide a more nuanced analysis of the potential mediation effect of a specific dimension of teacher attitudes toward EBPs on the relationship among organizational factors and implementation fidelity. In sum, with consideration of the type of EBPs, RQ 3 and 4 examined the specific mediation effects of educators’ perception of EBP requirement on the relationship between organizational factors and implementation fidelity for SWPBIS or PATHS, respectively.

**Analytic plan for RQs 1 and 2.** In recognition of the nested structure of the data (i.e. individual teachers nested within schools) and the cross-level theoretical basis of the variables assessed in this study, hierarchical linear modeling (HLM) was used to address RQs 1 and 2. First, the nature of the cross-level data in this study indicated that educators were nested within schools. The nesting or clustering effect introduced a potential violation of the assumption of independence between observations, which may prohibit the use of multiple regression. Second, the use of HLM takes into account both school- and individual-level influences, which can yield more accurate estimates of coefficients and standard errors.

Although HLM appeared the most appropriate analytic technique given the nature of the data relative to other techniques such as typical multiple regression techniques (e.g. HLM is more apt to avoid Type-1 errors caused by the nesting effect), there was a need for both conceptual and quantitative indicators to warrant the use of HLM (Raudenbush & Bryk, 2002). First, the determination of an adequate sample size for HLM (sufficient
statistical power) depends on (a) the sample sizes at each level; and (b) the number of parameters to be estimated (Leyland & Goldstein, 2001; Peugh, 2010; Snijders & Bosker, 1993). A general rule of thumb is to obtain as many units as possible at the top level of the hierarchy which is usually the foci of the analysis and research questions (Snijders & Bosker, 1993). The RQs 1 and 2 in the current study were primarily concerned with the potential cross-level associations between school-level organizational factors and individual attitudes. Therefore, emphasis should be placed on the sample size at the school level. Furthermore, the adequate sample size at any level was recommended to be more than 25 times the number of parameters to be estimated at that level, with the minimal participants-parameter-ratio being 10:1 (Kline, 1998). The series of multilevel models specified for RQ 1 and 2 all met the criteria.

As a quantitative indicator, the statistical power for the multilevel models fitted in the current study was estimated by G-power (Faul, Erdfelder, Buchner, & Lang, 2009). Seminal research by Cohen and Faul (Cohen, 1988; Faul et al., 2009) indicated in HLM (which is the primary model built in the current study), a medium effect size of Cohen’s $f^2$ is .15 which is equivalent to a value of 0.13 for $\rho^2$ (a common effect size for HLM). Considering the numbers of level-1 and level-2 units in the sample ($n_{lv1} = 441$, $n_{lv2} = 52$, respectively), the hypothesized effect size based on literature, and the number of parameters in the final full model ($n_{parameters} = 18$), the power estimated by G-power indicated that the sample sizes at both levels were fairly adequate (Faul et al., 2009).

Finally, the existence of significant intraclass correlation coefficients (ICC) was checked and confirmed (Biemann & Heidemeier, 2010; Bliese, 1998). The ICC in the null model is .13 and statistically significant, which indicates that individual teacher’s
attitudes toward EBPs are significantly clustered or similar within a single school but varied between schools (Raudenbush & Bryk, 2002). It also indicated that a considerable portion of the variance in individual-level teacher’s attitudes can be accounted for by the school-level factors, which is consistent with the theoretical expectations derived from the literature review. ICCs were calculated as an indicator for the clustering effect for all models during the modeling process (see Table 5). Taking the conceptual and quantitative indicators together, HLM was deemed as an appropriate analytic approach to address RQs 1 and 2 using the current analytic sample.

*Model building procedure for RQs 1 and 2.* A two-level hierarchical linear modeling (HLM) procedure was used to detect and assess the cross-level associations among school-level general and implementation-specific leadership and climate with individual-level teachers’ attitudes toward EBPs. The specialized software for multilevel modeling HLM version 6.08 was used in model building (Raudenbush, Bryk, & Congdon, 2009). A series of hierarchical linear models were built based on RQs 1 and 2 (see Tables 5, 6 and Equations) in a stepwise manner.

First, the Null model served as the basis for all consequent model building. It only included a Random Intercept for the level 1 outcome variable (individual teachers’ attitudes toward EBPs). Individual- and school-level demographic covariates (e.g. educator’s gender, age, race, teaching experience and grade-level served; school enrollment, percentage of non-white students) were controlled at each level in all Null models, while excluded from the final models if prove not statistically significant.

Next, leadership or climate models were built from the Null models by entering the respective organizational factors at each level. There are two types of variables
(individual-level or school-aggregate) representing each organizational factor (general and implementation-specific leadership and climate). These variables entered separately into the level 1 or 2 equations in the leadership or climate models to discern the differences between school-level organizational factors (i.e. school-level aggregates of the general and implementation-specific leadership or climate) and individual-level educators’ perceptions of the same organizational factors. For RQs 1 and 2, individual-level variables (e.g., specific dimensions of attitudes toward EBPs, individual perceptions of general and implementation-specific leadership or climate, gender, grade, and teaching experience) were included in the Level 1 equations, while the school-level demographics and the aggregates of general and implementation-specific leadership or climate were included in Level 2 equations (see Table 5, 6, 7, and Equations).

The configuration of the model numbers follows a unified rule to facilitate smooth navigation, report, and interpretation of the results in a stepwise manner. Specifically, the first digit indicates the research questions number, the second digit indicates the outcome variable (1 = Requirement; 2 = Openness; and 3 = EBP Appeal), while the last digit indicates the focus of the model (0 = Null Model; 1 = Leadership Model; 2 = Climate Model). For instance, Model 1.2.2 is for RQ 1, with the subscale of Openness being the DV, and is a Climate Model.

**Model building for RQ 1.** First, a random intercept only model was built using the subscale of Requirement as the outcome variable (Null Model 1.1.0) while controlling for individual- and school-level demographic covariates. After examining the ICC and retaining significant covariates in the null model, the individual- and school-level variables of general and implementation-specific leadership were entered (Leadership
Model 1.1.1). Similarly, Climate Model 1.1.2 was built from the Null Model 1.1.0 by entering the individual- and school-level variables of general and implementation-specific climate. The separation of leadership and climate factors into two models was due to the fact that the leadership and climate factors demonstrated strong correlations (i.e. severe multicollinearity issues) which would attenuate the significances if simultaneously included in a multilevel model. The same three-step model building procedure was replicated for the other two subscales of EBPAS (i.e., Models 1.2.0 to 1.2.2 for Openness; Models 1.3.0 to 1.3.2 for EBP Appeal; see Tables 5, 6, and Equations).

**Model building for RQ 2.** RQ 2 focused on examining the interaction effects between general and implementation-specific measures of leadership or climate after holding constant significant covariates identified previously. Building off the models from RQ1, the individual- and school-level interaction terms of implementation-specific leadership or climate were entered to build Model 2.1.1 or Model 2.1.2, respectively, while EBP Requirement served as the DV at level 1. The same procedure was replicated for the other two dimensions of teacher attitudes toward EBPs (i.e. Models 2.2.1 and 2.2.2 for EBP Appeal; Models 2.3.1 and 2.3.2 for Openness), to further investigate the potentially differential interaction effects between organizational factors on different dimensions of teachers’ attitudes toward EBPs (see Tables 5, 7 and Equations).

A significant interaction effect renders the main effects uninterpretable because the effect of one variable depends on the level of another variable. Therefore, only the significant interaction effect was interpreted by inspecting plots that visualize means of DV at different levels of each of the variables. First, the continuous variables of the
organizational factors were all binned into categorical variables with three values (Low = values from lowest to 33rd percentile, Medium = values from 34th percentile to 66th percentile, and High = values from 67th percentile to highest). Then, interaction effects were plotted with implementation-specific organizational factors represented by separate lines, general organizational factors represented by the X-axis, and DV represented by the Y-axis (see Figures 1 through 4).

**Effect size estimates for RQs 1 and 2.** To estimate the magnitude of the effect produced by cross-level associations and the potential individual- and school-level interactions of general versus implementation-specific leadership and climates, coefficients with robust standard errors of the fixed and random effects in the models were computed (see Tables 5, 6 and 7). Specifically, the variance components at both level 1 and 2 were estimated via the Maximum Likelihood procedure. The level 1 coefficients were estimated via the Empirical Bayes method, while level 2 coefficients were estimated by the Generalized Least Squares method (Raudenbush, Bryk, & Congdon, 2009). Also, intra-class correlations (ICCs) were calculated for each of the models to confirm the existence of significant clustering effects of the DVs (see Table 5).

**Analytic plan for RQ 3.** As discussed earlier, the relationship among school organizational factors, teachers’ attitudes toward EBPs, and implementation fidelity was hypothesized to vary depending on the type of universal EBPs being implemented (e.g., school-wide versus classroom-focused), which was preliminarily supported by the significant correlations between the type of EBP, fidelity, and organizational factors. Given that SWPBIS and PATHS represent different approaches to universal EBP implementation, the association among organizational factors, teachers’ attitudes, and
implementation fidelity of SWPBIS is better modeled at the school level, while the association for the implementation of PATHS is better modeled at the individual teacher level. Therefore, the dataset was split into two, with one containing the school-level variables associated with SWPBIS and the other containing the individual-level variables from schools implementing PATHS. With each dataset, a series of three multiple linear regression models were fitted to examine the relationships between specific dimensions of teachers' attitudes toward EBPs and organizational factors (general and implementation-specific leadership/climate) and fidelity of implementation (see Table 8).

**Model building for RQ 3.** The basic assumptions of multiple linear regression (i.e. normality, homoscedasticity, and absence of multicollinearity) were checked to ensure the adequacy of the data (Osborne & Waters, 2003). To begin with model building with the SWPBIS dataset, the general and implementation-specific organizational context factors (i.e. leadership and climate) were separately entered into multiple linear regression Models 3.1.1 and 3.1.2 to predict school-level fidelity as the outcome variable. Then the outcome variable was changed into the subscale of Requirement to build Model 3.2.1 and 3.2.2. Finally, the subscale of Requirement, together with the organizational factors identified in Model 3.1.1 and 3.1.2, was used to predict implementation fidelity in Model 3.3. The same procedure was carried out with the PATHS dataset (see Table 8 and Equations).

**Effect size estimates for RQ 3.** Cohen's $f^2$ was calculated as an effect size index and is one of the most widely used ones derived from the multiple correlation coefficient ($R^2$). The rule of thumb for determining the magnitude of Cohen's $f^2$ is 0.02 (small effect), 0.15 (medium), and 0.35 (large), respectively (Cohen, 1988; see Table 7).
**Analytic plan for RQ 4.** Analysis of mediation effects, also known as conditional process analysis, is used when the analytic goal is to describe and explain the conditional nature of the mechanisms by which a series of factors transmits its effect onto another (Hayes, 2012; Preacher & Hayes, 2004). The mediational analytic approach used in the current study is the nonparametric bootstrapping analysis of mediation effects via PROCESS (Preacher & Hayes, 2004; Preacher, Rucker, & Hayes, 2007). In addition to calculating the common model coefficients, standard errors, $t$- and $p$-values, and confidence intervals using ordinary least squares regression, PROCESS can generate robust estimates of the total, direct and indirect effects in mediation models with a single or even multiple mediators (Hayes, 2012).

Although the PROCESS approach similar to the causal steps approach by Baron and Kenny (1986), it resolves some of the issues of the causal steps approach acknowledged in the literature (e.g. the lack of accurate estimate of the indirect effect or relevant inferential test about it, the interpretation of statistical inferential results on sheer logic reasoning). Based on the existing guiding researches about power analysis for detecting the mediation effect (Fritz, Cox, & MacKinnon, 2015; Fritz & MacKinnon, 2007; Hayes, 2013; MacKinnon, Fairchild, & Fritz, 2007), the current analytic sample is fairly adequate for the proposed mediational analysis. Finally, the current study utilized nonparametric bootstrapping to estimate robust standard errors and coefficients, which theoretically increased the power of statistical tests by re-sampling and reducing the need for strict assumptions of the sampling distribution (Preacher, Rucker, & Hayes, 2007).

**Model building for RQ 4.** The focus of the mediational analyses is to examine whether teachers' attitudes toward EBPs mediate the relationship between organizational
factors and fidelity of implementation. First, statistical assumptions underlying performing the mediational analysis were checked (e.g. normality, homoscedasticity, and absence of multicollinearity; Baron & Kenny, 1986). Non-significant school-level (i.e. enrollment, diversity) or teacher-level covariates (age, gender, grade level taught, and teaching experience) were removed to preserve the parsimony of the final mediation model. Similar to RQ 3, given that SWPBIS and PATHS represent different approaches to universal EBP implementation, the mediation for SWPBIS is better modeled with school-level data, while the mediation for PATHS is better modeled with individual-level data (see Table 9 and Figures 5 through 7).

For the models examining SWPBIS implementation, all the variables were aggregated to the school level. The significant organizational factor/s identified in RQ 3 served as the predictor for the mediational model/s. The school-level aggregated subscale of Requirement served as the mediator while the school-level implementation fidelity served as the outcome variable in the mediation models. For the models examining PATHS implementation, all models were fitted with the individual-level variables. The significant variables representing individual perceptions of organizational factors identified in RQ 3 separately served as the predictor for each of the mediational models. The individual-level variable representing the subscale of Requirement served as the mediator while fidelity measured at the classroom/teacher-level served as the outcome variable across the additional mediation models to be built.

**Effect size estimates for RQ 4.** In the nonparametric bootstrapping approach of mediation analysis, a mediation effect is deemed significant if the 95% Bias Corrected bootstrap confidence intervals (CI) for the indirect effect do not include zero based on the
results of 5000 bootstrapped samples (Preacher & Hayes, 2004; Preacher et al., 2007). With a significant indirect effect, the effect is deemed as partial mediation if the direct effect is also significant, or complete mediation if the direct effect is nonsignificant.

**Chapter 4. Results**

**Preliminary Analysis**

Descriptive statistics (e.g. measures of central tendency and variability, percentage of missingness, distribution statistics, and correlation coefficients) were calculated for all predictors, outcome variables, and covariates to be used in the model building process for RQs 1 through 4 (See Tables 1, 2, 3 and 4 for details). Overall, the basic statistical assumptions for HLM and multiple regression were generally met. Specifically, the variability of most variables was deemed as acceptable as evidenced by proportional values of standard deviations and mean, with the exception of the Divergence subscale from EBPAS. Next, the pattern of missingness was deemed acceptable for subsequent analysis because of the low levels of missing data. The average percentage of missingness in covariates was less than 1%. Furthermore, acceptable diagnostic statistics supported the assumption that the variables in the dataset approximated a normal distribution (e.g., skewness between -1.96 and 1.96; kurtosis between 2 and 3; visual inspection of the Normal Q-Q Plots).

Results from the bivariate correlation matrix indicated significant relationships across many of the variables assessed in this study (Table 4). For example, of the organizational variables, implementation-specific leadership demonstrated the strongest overall associations with general leadership while general climate had the lowest overall correlations with all other organizational factors. Of the EBPAS subscales, the
Divergence subscale had the weakest overall correlations with organizational factors while Openness and EBP Appeal had the strongest. The magnitudes of the correlations among the outcome variables in RQs 1 and 2 were generally moderate and significant with the exception of the Divergence subscale (i.e. demonstrated weak correlation).

When examining correlations between subscales of EBPAS and fidelity of implementation, only EBP Requirement demonstrated a significant correlation.

**Research Question 1: Associations between Organizational Factors and Attitudes**

A series of hierarchical linear models were conducted to address RQ 1. First, a summary of the ICCs and significant covariates identified in the null models for the three outcome variables (Requirement, Openness, and EBP Appeal) were reported. Next, the results of the final models were discussed in the following order for each DV (a) Leadership Models, including ICC, random and fixed effects, and (b) Climate Models, including ICC, random and fixed effects.

**Null models, ICCs, and covariates for each DV.** A null model was a random-intercept-only model including only school (enrollment, diversity, and socioeconomic status) and individual covariates (experience, gender, grade level) with a random level 1 intercept. Results of three null models (see Table 5 and Equation) including Requirement, Openness, and Appeal as the DVs, respectively, revealed that the level 2 variance components of the random level 1 intercept (i.e., the between-school variation in each DV) were significant, indicating there was significant variance unexplained for the school mean scores of each DV. The ICCs for Requirement, Openness, and Appeal were .05, .06 and .06, respectively, which demonstrated small yet significant between-school
differences in the three DVs ($p < .05$) and confirmed the appropriateness of multilevel analysis.

**Examining covariates for each model.** In the Null Model 1.1.0 with Requirement as the DV, none of the covariates in the models were significant, resulting in their exclusion from the final models. In the Null Model 1.2.0 with Openness as the DV, at level 1, significant covariates were the teacher grade level and experience, which indicated that an increase in either grade-level or teaching experience was associated with a small but significant drop in the teacher openness to implementing EBPs. At level 2, the only significant covariate was school enrollment size, which indicated that increased enrollment was associated with an increase in the school mean of teacher openness to delivering EBPs. Therefore, grade level, experience, and enrollment were included in the final models 1.2.1 and 1.2.2. In the Null Model 1.3.0 with EBP Appeal as the DV, at the level 1 equation, significant covariates included teacher gender (fixed effect coefficient = .24) and experience (fixed effect coefficient = -.01), which indicated that (a) as compared to male teachers, female teachers tended to perceive delivering EBPs as appealing, and (b) an increase in teaching experience was associated with a small but significant drop in the teacher EBP appeal. At the level 2 equation, the only significant covariate was a school’s enrollment size (fixed effect coefficient = .0006), which indicated that an increase in enrollment was associated with an increase in the school mean of teacher EBP appeal. Therefore, teacher gender, experience, and school enrollment were included in the final models 1.3.1 and 1.3.2. For details about covariates in null models, see Table 6 and Equation.
Leadership model with EBP Requirement as DV. Building on the null model 1.1.0, school- and individual-level general and implementation-specific leadership were included in the level 2 and level 1 equations, respectively (Model 1.1.1; see Table 5 and Equation). The ICC was .05 and demonstrated a small yet significant between-school difference in EBP Requirement ($p < .01$). The level 2 variance component of the random level 1 intercept was significant (i.e. between school difference of EBP Requirement; variance ($\mu_{0j}$) = .03; $\chi^2 (49, n = 52) = 74.15, p < .05$), indicating there remained a significant amount of variance (87.94%) unexplained beyond that explained by school-level general and implementation-specific leadership together (12.06%).

Fixed effects. At the school level, after holding constant the variance explained by the variables, only school-level general leadership (coefficient = -.37; Approximal T-ratio (49) = -2.15, $p < .05$) emerged as statistically significant. This result suggested that an increase in school-level general leadership was associated with a slight drop in teachers’ perceptions of EBP Requirement. At the individual level, the fixed effects of general and implementation-specific leadership both indicated significant and positive associations with EBP Requirement (see Model 1.1.1 in Table 6 and Equation), indicating that they both explained a unique amount of variance in individual teacher perceptions regarding whether delivering EBPs is required.

Climate model with EBP Requirement as DV. The ICC of Model 1.1.2 was .04, demonstrating a small yet significant between school-difference in EBP Requirement ($p < .01$). The level 2 variance component of random level 1 intercept was statistically significant (i.e. between school difference of EBP Requirement; variance ($\mu_{0j}$) = .03; $\chi^2 (49, n = 52) = 74.15, p < .05$), indicating there were still significant amount of variance
(80.60%) remaining unexplained, apart from the amount of variance (20.40%) explained by school-level general and implementation-specific climate together (see Table 5 and Equation).

**Fixed effects.** At the school level, results revealed that neither school-level general nor implementation-specific climate were significant after holding constant variance accounted for by the other variables. At the individual teacher level, the fixed effects of individual perceptions of general and implementation-specific climate were both significantly positively related to EBP Requirement (see Model 1.1.2 in Table 6 and Equation), indicating that an increase in teachers’ perceptions of general and implementation-specific climate were associated with a significant increase in their perceptions of whether EBP implementation is required.

**Leadership model with EBP Openness as DV.** Analyses continued to build on the null model 1.2.0 by including school- and individual-level general and implementation-specific leadership in the level 2 and level 1 equations, respectively (Model 1.2.1; see Table 5 and Equation). The ICC was .02 and approached significant, indicating a minimal amount of between-school differences on school-level means of Openness. The level 2 variance component of the random level 1 intercept also approached significance (i.e. between school difference of teachers’ openness to delivering EBPs; variance ($\mu_{0j}$) = .006; $\chi^2 (48, n = 52) = 63.02, p = .07$), indicating that, controlling for the school-level general and implementation-specific leadership, the remaining unexplained between-school variance of teacher's openness to EBPs was nonsignificant.
**Fixed effects.** At the school level, results suggested that neither school-level general nor implementation-specific leadership were significant predictors of school-level teacher openness to EBP. At the individual teacher level, general and implementation-specific leadership were found to have significant positive associations with teacher openness to EBP (see Model 1.2.1 in Table 6 and Equation), indicating that after controlling for teacher experience and grade level both of the variables accounted for a significant amount of variance in teacher openness to delivering EBPs.

**Climate model with EBP Openness as DV.** This model included school- and individual-level general and implementation-specific climate as predictors of Openness in the level 2 and level 1 equations, respectively (Model 1.2.2; see Table 5 and Equation). Similar to the Leadership Model, the ICC and level 2 variance component of the random level 1 intercept (i.e. between school difference of EBP Openness; variance ($\mu_{0j}$) = .0002); $\chi^2$ (48, $n = 52$) = 48.45, $p = .46$) approached but were not significant. The finding indicated that after controlling for school-level general and implementation climate the remaining unexplained between-school variance in teacher's openness to EBPs was nonsignificant.

**Fixed effects.** At the school level, neither of the fixed effects of school-level general or implementation-specific climate was statistically significant, indicating that the school-level general and implementation-specific climate were not associated with the school mean of aggregated teachers' perception regarding openness to delivering EBPs. At the individual teacher level, the fixed effects of individual perceptions of general and implementation-specific climate were both significant (see Model 1.2.2 in Table 6 and Equation), indicating that after controlling for covariates an increase in general and
implementation-specific climate were associated with an increase in teacher’s openness to delivering EBPs.

**Leadership model with EBP Appeal as DV.** This model included school- and individual-level general and implementation-specific leadership as predictors in the level 2 and level 1 equations, respectively (Model 1.3.1; see Table 5 and Equation). The ICC was nonsignificant indicating minimal between-school variance. The level 2 variance component of the random level 1 intercept (i.e. between school difference of EBP Appeal; variance \( \mu_{0j} = .0009 \); \( \chi^2 (48, n = 52) = 58.62, p = .14 \)) was also nonsignificant, indicating that controlling for the school-level general and implementation-specific leadership the remaining unexplained between-school variance in teacher's perception of EBP Appeal was nonsignificant.

**Fixed effects.** Similar to Openness, results revealed that neither the fixed effect of school-level general nor implementation-specific leadership were significant. At the individual teacher level, only the fixed effect of teacher perceptions of general leadership was significant (see Model 1.3.1 in Table 6), indicating an increase in teacher perceptions of general leadership was associated with an increase in their perceived EBP appeal.

**Climate model with EBP Appeal as DV.** The null model 1.3.0 was expanded to include school- and individual-level general and implementation-specific climate in the level 2 and level 1 equations, respectively (Model 1.3.2; see Table 5 and Equation). Similar to the Leadership Model, the ICC was small and non-significant. The level 2 variance component of the random level 1 intercept was also nonsignificant (i.e. between school difference of EBP Appeal; variance \( \mu_{0j} = .0004 \); \( \chi^2 (48, n = 52) = 56.92, p = .18 \)), indicating that, controlling for the school-level general and implementation
climate, the remaining unexplained between-school variance in teacher's perception of EBP Appeal was nonsignificant.

**Fixed effects.** At the school level, only the fixed effect of school-level implementation-specific climate emerged as significant after controlling for the variance explained by other variables, indicating an increase in school-level implementation-specific climate was associated with increased teacher EBPs appeal. At the individual teacher level, only the fixed effect of teacher perceptions of general climate explained significant unique variance in EBP appeal (see Model 1.3.2 in Table 6), indicating the increase in a teacher’s perceptions of general climate was associated with an increase in his/her perceptions of EBP appeal.

**Research Question 2: Interactions of General and Implementation-Specific Factors**

Results of the models including interaction terms between general and implementation-specific factors are discussed for each DV (EBP Requirement, Openness, and Appeal).

**EBP Requirement interaction models.** When examining the school- and individual-level interactions between general and implementation-specific leadership on teachers’ perceptions of EBP requirement, results of fixed effect estimate and model fit index (-2 log-likelihood) indicated that the interaction term was not significant at either level 2 or 1 (Model 2.1.1; see Table 7 and Equation). These results suggested that, at either school- or individual-level, the associations between implementation-specific leadership and teacher perceptions of EBP Requirement were not found to depend on the degree of general leadership after controlling for the variance explained by other variables. Similar findings were found for the school- and individual-level interactions
between general and implementation-specific climate (Model 2.1.2; see Table 7 and Equation), indicating that, at either school- or individual-level, general climate did not moderate the relationship between implementation-specific climate and teacher perceptions related to whether EBPs are required.

**Openness to EBP interaction models.** When examining the interaction between general and implementation-specific leadership on teacher school- and individual-level openness to delivery of EBPs, results of fixed effect estimate and model fit index (-2 log-likelihood) indicated that the interaction term was not significant at either level 2 or 1 (Model 2.2.1; see Table 7 and Equation). Similar findings were found for the interaction between general and implementation-specific climate, indicating that, at either school- or individual-level, general climate did not moderate the relationship between implementation-specific climate and teachers’ perceptions related to whether EBPs are required (Model 2.2.2; see Table 7 and Equation).

**EBP Appeal interaction models.** For the leadership interaction model, the deviance index indicated that introducing the school-and individual-level interaction terms of general and implementation-specific leadership into the Model 1.3.1 resulted in significantly more variance explained in a teacher’s EBP Appeal (i.e. a significantly reduced deviance; 2 log-likelihood (2) = 12.50, p < .001; see Table 7 and Equation).

At the school level, the fixed effect for the interaction term of general and implementation-specific leadership was significant yet negative (coefficient = -.21), as well as the main effect of implementation-specific leadership (coefficient = .66). To interpret the significant interaction effect, as described above, group marginal means were plotted and visually inspected to examine how the association between
implementation-specific leadership and school-level teachers’ EBP appeal depends on the level of general climate. As depicted in Figure 1, the effect of school-level implementation-specific leadership on the school-level teachers’ EBP Appeal varied based on different levels of general leadership. Specifically, among the schools with low general leadership, high implementation-specific leadership did not show a predictable relationship with EBP Appeal because schools with low general leadership and moderate implementation-specific leadership were associated with the highest EBP Appeal. However, when general leadership is moderate or high, high implementation-specific leadership was consistently associated with the highest levels of EBP Appeal. In sum, the results suggested that the effect of high implementation-specific leadership on school-level teachers’ EBP Appeal depends on whether general leadership is low or high. It is also noteworthy to mention that there were no schools with high levels of general leadership that also had low levels of implementation-specific leadership, which suggested the level of general leadership acts as a floor for implementation-specific leadership in a school.

A similar significant interaction effect (coefficient = .12) was found at the individual teacher level. Visual analysis of Figure 2 revealed that, when general leadership increases, the effect of moderate and high levels of implementation-specific leadership also increases which leads to higher levels of teacher EBP Appeal.

**Climate interaction model.** Similar to the finding in the Leadership Interaction Model, the deviance index indicated that introducing the school-and individual-level interaction terms of general and implementation-specific climate into the Model 1.3.2 resulted in significantly more variance explained in an teacher EBP Appeal (i.e. a
significantly reduced deviance; 2 log-likelihood (2) = 12.50, \( p < .001 \); see Table 7 and Equation). At the school level, the fixed effect for the interaction term of general and implementation-specific climate was significant and negative (coefficient = - .61), as well as the main effect of implementation-specific climate (coefficient = 2.03). As depicted in Figure 3, at the school level, the effect of implementation-specific climate on teachers' EBP appeal varies according to general climate. Specifically, among the schools with a high general climate, the ones with medium implementation-specific climate were associated with the highest school level aggregated teachers' EBP Appeal. Different from the leadership model, when general climate is moderate or low, high implementation-specific climate was consistently associated with the highest levels of EBP Appeal. Of particular note is that, among the schools with high implementation-specific climate, improvement in general climate was associated with little to none increase in school-level teachers’ EBP Appeal. In sum, the result suggested that the effect of high implementation-specific climate on school-level teacher EBP Appeal depends on whether general climate is high or not.

Unlike the school-level analysis, a nonsignificant finding was found for the climate interaction and predictors at the individual teacher level (see Table 7 and Figure 4), indicating an individual educator’s perception of general climate did not serve as a significant moderator of the relationship between individual teacher perceptions of implementation-specific climate EBP Appeal.

**Research Question 3: Association between Organizational Factors, Attitudes and Implementation Fidelity.**
To address RQ3, analyses were conducted separately for SWPBIS and PATHS schools because they represent different approaches to EBP implementation. Additionally, only the Requirement subscale from the EBPAS was used because it was the only subscale with a significant and sizable bivariate correlation with fidelity.

Models with schools implementing SWPBIS.

Organizational factors predicting fidelity. Using school level aggregated data, SWPBIS Models 3.1.1 and 3.1.2 entered the general and implementation-specific leadership and climate to predict SWPBIS fidelity while controlling for school level covariates (i.e. enrollment size, diversity, and socioeconomic status), respectively (see SWPBIS Models in Table 8). The effect sizes (e.g., $f^2$, $R^2$) collectively suggested that general and implementation-specific leadership or climate explained a meaningful amount of the variance in the SWPBIS fidelity (Leadership: $F(2, 38) = 2.19$, $p = .13$, $R^2 = .11$, 95% CI = -.03, .25, $f^2 = .12$; Climate: $F(2, 38) = 1.95$, $p = .16$, $R^2 = .10$, 95% CI = - .04, .24, $f^2 = .11$), although neither were statistically significant. Similar to the model fit index, regression coefficients of the general or implementation-specific leadership or climate were of moderate size but were nonsignificant.

Organizational factors predicting Requirement subscale. The general and implementation-specific variables of leadership (Model 3.2.1) or climate (Model 3.2.2; see SWPBIS Models in Table 8) were entered to predict school-level teacher EBP Requirement, while controlling for school level covariates (i.e. enrollment size, diversity, and socioeconomic status). Consistent with findings from RQ 1, the effect sizes (e.g., $f^2$, $R^2$) collectively suggested that general and implementation-specific leadership or climate explained a sizable amount of the variance in the EBP Requirement (Leadership: $F(2, 38)$
= 1.16, p = .33, R^2 = .06, 95% CI = - .30, .42, f^2 = .06 ; Climate: F(2, 38) = .89, p = .42, R^2 = .05, 95% CI = - .31, .41, f^2 = .05), although neither was statistically significant. Furthermore, regression coefficients of the general or implementation-specific leadership or climate turned out nonsignificant.

**EBP Requirement and organizational factors predicting fidelity. SWPBIS**

Models 3.3.1 and 3.3.2 (see SWPBIS Models in Table 8) entered EBP requirement with general and implementation-specific leadership and climate to collectively predict the implementation fidelity of SWPBIS. Again, the effect sizes (e.g., f^2, R^2) collectively suggested that EBP Requirement, general and implementation-specific leadership or climate explained a sizable amount of the variance in SWPBIS fidelity (Leadership: F(3, 35) = 1.96, p = .14, R^2 = .14, 95% CI = 0, .28, f^2 = .17 ; Climate: F(3, 35) = 1.89, p = .15, R^2 = .14, 95% CI = 0, .28, f^2 = .16), although neither was statistically significant. Regression coefficients of the general or implementation-specific leadership or climate and EBP Requirement turned out nonsignificant, too.

**Follow-up analyses for understanding non-significance.** Although the F values and regression coefficients were nonsignificant, the effect size estimates and percent variance explained by each model were moderate and meaningful (i.e., f^2, R^2), which suggested results may be due to a statistical artifact (i.e. inflated standard errors and p values) caused by multicollinearity and/or lack of power. A series of follow up analyses, including partial least squares regression (PLS; Geladi & Kowalski, 1986), mean-centering of predictors, hierarchical regression approach, and bootstrapping, further confirmed that non-significance was driven by these factors.
Given issues with lack of power and multicollinearity, mediational analyses examining whether EBP Requirement mediates the relationship between organizational factors and SWPBIS fidelity were not performed.

**Models with schools implementing PATHS.**

**Organizational factors predicting fidelity.** Using individual-level data, PATHS Models 3.1.1 and 3.1.2 entered the general and implementation-specific leadership or climate to predict implementation fidelity of PATHS while controlling for school-level covariates (i.e. enrollment size, diversity, and socioeconomic status), respectively. None of the covariates were significant and thus were removed from subsequent analyses. General and implementation-specific leadership explained a significant amount of the variance in the PATHS fidelity (F(2, 90) = 6.24, p < .01, R² = .12, R²Adjusted = .10), while general and implementation-specific climate also explained a significant amount of the variance in the PATHS fidelity (F(2, 90) = 4.08, p < .001, R² = .08, R²Adjusted = .06). Regression coefficients showed that only implementation-specific leadership and climate were significantly and positively associated with PATHS fidelity (see PATHS Models in Table 8). A follow-up hierarchical regression approach demonstrated that the coefficient of general leadership was nonsignificant before the implementation-specific climate was entered into the model, which precluded the confounding effect of multicollinearity.

**Organizational EBP Requirement.** The general and implementation-specific variables of leadership (PATHS Model 3.2.1) or climate (Model 3.2.2; see PATHS Models in Table 8) were entered to predict individual teacher EBP Requirement. Both models explained a significant amount of the total variance in perceptions of EBP Requirement (leadership model: F(2, 90) = 12.33, p < .001, R² = .22, R²Adjusted = .20;
climate model: F(2, 90) = 12.42, p < .001, R^2 = .22, R^2_{Adjusted} = .20). However, regression coefficients revealed divergent findings between leadership and climate models. Neither general nor implementation-specific leadership were found to be significantly associated with individual teacher’s perception of EBP Requirement, while general and implementation-specific climate both demonstrated significant positive associations (general: Beta = .26, t(90) = 2.31, p < .05; implementation-specific: Beta = .27, t(90) = 2.48, p < .05). A follow-up hierarchical regression approach demonstrated that when variables were entered in a stepwise fashion the coefficients of general and implementation-specific leadership were both significant but became nonsignificant when the other variable was entered into the model due to their significant shared variance.

**EBP Requirement and organizational factors predicting fidelity.** PATHS Models 3.3.1 and 3.3.2 (see PATHS Models in Table 8) entered EBP Requirement as well as general and implementation-specific leadership and climate to collectively predict PATHS fidelity. Both models explained significant amount of the variance in PATHS fidelity (Leadership: F(3, 89) = 4.32, p < .01, R^2 = .13, R^2_{Adjusted} = .10; Climate: F(3, 89) = 3.25, p < .05, R^2 = .10, R^2_{Adjusted} = .07). Regression coefficients further revealed that only implementation-specific leadership and climate were significantly and positively associated with PATHS fidelity after holding constant the variance from all other variables (see PATHS Models in Table 8). Again, the follow-up hierarchical regression approach revealed that general leadership was significant but became nonsignificant when controlling for the variance in PATHS fidelity explained by other variables.

Collectively, the findings suggested a mediational analysis was likely to be detected using the PATHS dataset with individual teacher level PATHS fidelity and the
individual-level variables of the organizational factors, except for general climate which demonstrated nonsignificant relationships with PATHS fidelity even if controlling for multicollinearity.

**Research Question 4: Mediation of EBP Requirement on Organizational Factors and PATHS Fidelity**

**Leadership mediation models.** For implementation-specific leadership (see Model 4.1 in Table 9 and Figure 5), based on the results of 5000 bootstrapped samples (Preacher & Hayes, 2004), the indirect effect of EBP Requirement was nonsignificant (.004; 95% CI = -.0051, .0145), while the direct and total effects of implementation-specific leadership were both significant (direct: .04, t = 2.79, p < .01; total: .04, t = 3.47, p < .001). The result indicated that EBP Requirement did not mediate the significant effect of implementation-specific leadership on PATHS fidelity.

For general leadership (see Model 4.2 in Table 9 and Figure 6), both the indirect effect of EBP Requirement and direct effect of general leadership was nonsignificant (mediation: .01; 95% CI = -.003, .019; direct: .03, t = 1.77, p = .08), while the total effect was significant (.03, t = 2.51, p < .05). The result indicated that EBP Requirement did not mediate the significant effect of implementation-specific leadership on PATHS fidelity. This unique finding is potentially due to (a) the multicollinearity issues between EBP Requirement and the general climate; (b) there were other significant indirect effects of unknown confounding factors through which the total effect of general leadership on PATHS fidelity was fully explained and the direct effect of general leadership was completed bypassed.
**Climate mediation models.** For implementation-specific climate (see Model 4.3 in Table 9 and Figure 7), the indirect effect of EBP Requirement was nonsignificant (.006; 95% CI = -.0039, .0168), while the direct and total effects of implementation-specific climate were both significant (direct: .06, t = 2.11, p < .05; total: .04, t = 2.79, p < .01). The result indicated that EBP Requirement did not mediate the association between implementation-specific climate and PATHS fidelity.

**Chapter 5. Discussion and Summary**

This study extended school-based implementation research by strategically examining the interplay between general and implementation-specific organizational factors, teacher attitudes toward EBPs, and fidelity of universal EBP implementation. This study was unique and offers value-added contributions to the literature in a number of ways. First, consistent with prior research, this study examined these variables as organizational factors (i.e., school-level aggregates) and as individual-level psychological phenomena to examine more nuanced relationships and interpretations between these variables within and across individual and school levels. Second, special attention was paid to the type of universal EBP to determine whether the implementation of different types of EBPs (i.e., SWPBIS or PATHS) was differentially related to general and implementation-specific organizational factors and different dimensions of teacher attitudes toward EBPs. Third, this study sought to advance theory by examining whether specific dimensions of teacher attitudes toward EBP mediate the relationship between general and implementation-specific organizational factors and the fidelity of implementation of universal EBPs. Collectively, results revealed a number of noteworthy findings for discussion.
Relationships between Leadership, Climate and Teacher Attitudes toward EBP

The investigation into the relationships between general and implementation-specific factors and teacher attitudes toward EBP revealed that associations between these variables depended on the level of measurement (school organizational level or individual teacher level) and the specific attitudinal subscales used as DVs. For example, when examining specific subscales from the EBPAS, the amount of between-school variance explained by school-level leadership and/or climate factors were found to be significant for EBP Openness and Appeal, but not for EBP Requirement. One plausible explanation for the divergent finding for EBP Requirement is that there may be other school-level organizational factors, such as consistency with performance evaluation or localized policy, that better explain between-school variance in teacher perceptions of EBP requirement. For example, if a school has a well-established policy outlining the delivery of EBPs as part of teachers’ responsibilities and performance evaluations, teachers may have more favorable perceptions of EBP requirement compared to schools without such a policy (Fusarelli, 2002).

It will be important for future research to develop a better understanding of how specific attitudinal dimensions differentially associate with general and implementation-specific factors. Specifically, the findings call for future research expanding the existing subscales of EBPAS to identify and add certain attitudinal dimensions closely related to OIC factors (e.g., leadership, climate, and citizenship behaviors), which can guide implementation research and strategy development. Additionally, social cognitive theories structure the concept of attitude with three components (i.e., affective, behavioral (or conative), and cognitive; Calder & Lutz, 1972; Breckler, 1984). It is likely that the
general and implementation-specific organizational factors may behave differently in their influence on different components of teacher attitudes toward EBPs. For instance, literature has systematically identified two primary leadership behaviors with great influence on followers, initiating structure (focus on structure and guidance for task completion), and consideration (focus on relationships and communication). It is plausible that consideration leadership would exert more influence on the affective component of teacher attitudes toward EBPs, while “focus-on-task” leadership will be more influential on the cognitive and behavioral components.

Another pattern of findings that emerged was that most of the fixed effect estimates of the general and implementation-specific factors at school-level (i.e., level 2 equations) were nonsignificant. On the other hand, when examining individual teacher perceptions of general and implementation-specific leadership or climate at the individual level, significant positive associations were demonstrated for all three attitudinal DVs. There are multiple possible explanations for why findings differed depending on the level (school versus individual) at which the organizational factors were constructed and examined. First, the random intercept only models in the current study only set the intercepts of each DV to vary at the school level, which is based on the assumption that the between-school variation in each DV is solely reflected by the random intercept equation at level 2. Alternative models may function better than the random intercept only model in identifying and decomposing the between-school variation with both random intercept and random effects of level 1 variables enabling more nuanced examination of the associations of school-level and individual perceptions of implementation-specific leadership and climate.
Second, attitudes are defined as a person’s evaluative judgments rooted in the integration of specific beliefs that can impact a person's ambivalence, resistance, or motivation to engage in certain actions. The evaluative judgments and specific beliefs are individual psychological phenomena that are developed and changed by experiences and appraisals of the environment based on social-cognitive theory and ecological systems theory (Bandura, 2004; Bronfenbrenner, 1992). For instance, if certain supportive leadership behaviors conducive to EBP delivery are experienced and internalized by some teachers, those teachers’ attitudes are more likely to change in the favorable direction. Conversely, for teachers who do not experience and internalize the supportive leadership behaviors, or internalized in a negative way, their attitudes are unlikely to change or worsen. This alternative hypothesis can be tested by a multilevel moderation model where the effect of certain school-level organizational factors (e.g., implementation-specific leadership) on individuals’ attitudes toward EBPs (e.g., EBP Appeal) is moderated by individual teachers’ perceptions of those school-level organizational factors based on their experiences.

Another pattern of findings worthy of discussion pertained to the larger fixed effect coefficients (i.e., effect sizes) for general organizational factors than for implementation-specific factors. However, bivariate correlations revealed that implementation-specific factors generally demonstrated stronger associations with all the dimensions of teacher attitudes toward EBPs than general factors. There are multiple plausible explanations for this inconsistent finding. One explanation was the multicollinearity issues between general and implementation-specific organizational factors in both level 1 and 2 equations for all three attitudinal DVs. Multicollinearity is
known to cause biased or unusual change (inflation or deflation) in the estimation of effect coefficients and corresponding p values (Alin, 2010; P. Vatcheva & Lee, 2016). Future research should employ other analytical techniques, such as principal components analysis and/or multilevel latent variable model (MLVM), to address multicollinearity issues to generate unbiased coefficient estimates and p values. Nevertheless, the considerable correlations between general and implementation-specific leadership and climate can statistically be conceptualized as a mediational model where the effect of general organizational factors on teacher attitudes toward EBPs is mediated by implementation-specific factors which are more proximal to EBP implementation outcomes (MacKinnon, Krull, & Lockwood, 2000).

As mentioned above, the patterns of cross-level relationships from organizational factors also depended on the specific dimensions of attitudes toward EBP used as the DV. The total score was not used due to its general lack of utility from the standpoint of developing implementation strategies that aim to improve attitudes and monitor the impact of implementation strategies over time. Of the subscales included, EBP Openness, Appeal, and Requirement were included considering their significant bivariate associations with the measures in the models reflecting general and implementation-specific organizational factors and fidelity of implementation. Whereas EBP Openness and Appeal evidenced stronger associations with general and implementation-specific organizational factors, Requirement demonstrated the strongest associations with fidelity.

Lastly, some school and individual level demographic variables stood out as significant covariates across the models. At the level 2 equations, enrollment is consistently significant across the leadership and climate models and demonstrated
positive associations with EBP Openness and Appeal. Based on previous research, one plausible explanation may be that larger school enrollment is associated with more opportunities for teachers to expose to problem-solving situations which call for EBP adoption (Adams & Barron, 2009), which in turn promotes their perceptions of EBP openness and appeal. Interestingly, for the level 1 equations, a teacher’s experience and grade level were predictive of a small yet significant in perceptions of EBP openness and appeal. This is consistent with research demonstrating that older and more experienced teachers are found more likely to hold unsupportive beliefs toward new practices as compared to novice teachers (Gutshall, 2013; Lynott & Woolfolk, 1994; Teachers et al., 2003), and that grade-level was negatively associated with teachers’ favorable beliefs about students’ learning and practices (Hoover & Love, 2011).

**Interactions between General and Implementation-Specific Factors**

Theory suggests that general and implementation-specific organizational factors are likely to interact to influence implementation outcomes (Aarons et al., 2014; Ehrhart et al., 2014b; Farahnak, Ehrhart, Torres, & Aarons, 2019; Williams & Beidas, 2019). For example, a school leader must possess general leadership qualities as a necessary but insufficient characteristic to influence implementation-relevant outcomes. However, general leadership characteristics alone will not drive successful implementation. In addition to general leadership, a leader must engage in implementation-specific leadership behaviors to influence implementers’ attitudes and implementation behaviors (e.g., fidelity). The findings from this study provide partial support of this theory as both general and implementation-specific leadership and climate were found to significantly interact in their associations with teachers’ attitudes regarding EBP appeal.
Specifically, results suggested that there may be a certain threshold of general leadership or climate needed in order for implementation-specific leadership or climate to have a positive association with teacher perceptions of EBP appeal. Specifically, findings indicated at low levels of general leadership or climate, the corresponding implementation-specific factors did not have a predictable association with teacher EBP appeal. However, at moderate levels of general leadership and climate, high levels of implementation-specific leadership and climate were associated with higher teacher EBP appeal. These findings support efforts to not only examine variables in isolation but rather explore under what conditions certain organizational factors demonstrate the strongest associations with implementation outcomes of interest (Chaudoir, Dugan, & Barr, 2013; Durlak & DuPre, 2008).

It is important to touch on why EBP Appeal was the only attitudinal dimension a significant interaction effect between general and implementation-specific leadership and climate was observed. EBP appeal may represent a more malleable attitudinal dimension than EBP openness, which may represent more a personality dimension. For example, openness is one of the Big Five personality dimensions (Judge, Higgins, Thoresen, & Barrick, 1999; Tupes & Christal, 1992) and it may generalize to how people orient to and perceive taking on new EBPs. Also, there are likely additional dimensions of attitudes influenced by the interaction effect of general and implementation-specific organizational factors. For instance, Aarons and his colleagues developed an expanded version of EBPAS with 50 items measuring a total of 12 subscales (e.g., fit, balance, burden, limitations, and feedback, etc.). Future research should extend the current findings to
explore interaction effects between general and implementation-specific organizational factors on the different dimensions of attitudes toward EBPs.

**Relationship with Implementation Fidelity of Different Types of EBPs**

There were a number of signals from the results worthy of noting that suggested general and implementation-specific factors together explain meaningful variance in the fidelity of implementation of different types of universal EBPs. Models examining SWPBIS fidelity at the school-level revealed that general and implementation-specific leadership and climate explained a meaningful amount of variance SWPBIS fidelity (14.41 % and 13.95 %, respectively). Although model statistics did not reach significance, this was due to relatively low power and multicollinearity. The 95% Confidence Interval indicated that the percent variance accounted for could be as high as 28.46% or as low as .36 %, suggesting that the true percent variance accounted for is highly likely to be above zero. Moreover, this finding is consistent with both theory and previous research that has linked organizational factors to school-level implementation (Gregory, Henry, & Schoeny, 2007; Langley, Nadeem, Kataoka, Stein, & Jaycox, 2010; Lyon, Cook, et al., 2018; Owens et al., 2014)

Findings using individual-level data on teachers’ delivery of the PATHS social-emotional program with fidelity were consistent with the SWPBIS findings as general and implementation-specific factors together were found to account for a significant amount of variance in PATHS fidelity. When examining individual parameter estimates, only implementation-specific leadership and climate emerged as significant predictors in their respective models indicating they uniquely explained variance in the PATHS fidelity above and beyond the variance accounted for by the covariates and general
organizational factors. When combined with the results from SWPBIS fidelity, general and implementation-specific factors appear to combine to explain a meaningful amount of variance in different types of universal EBPs, whether an EBP represents more of a school-wide approach or a teacher-level classroom approach.

The findings revealed an absence of mediation effect of EBP Requirement on the relationship between OIC factors and PATHS fidelity at the individual teacher level. This nonsignificant finding revealed some critical suggestions for enhancing the original conceptualization of the mediation model where teacher attitudes toward EBP mediate the effect of organizational factors on PATHS fidelity at the individual teacher level. First, the result implies the existence of other unknown factors that confound the relationship between EBP requirement and implementation behavior (i.e., fidelity). As discussed in Chapter 2, the Theory of Planned Behavior (TPB; Ajzen, 1991, 1985) suggests that behavioral intention represents the mechanism through which attitudes and other individual-level factors (e.g., self-efficacy, perceived behavioral norms) influence behavior. Teachers’ intention to implement PATHS may be an important mediating factor in the relationship between teacher attitudes toward EBPs and PATHS fidelity, which was not accounted for in the current mediation model. Moreover, other models of behavior change, including the Health Action Process Approach (Schwarzer et al., 2011), suggest that there are motivational and volitional phases of behavior change. Attitudes may be an important motivational indicator of behavior change but it is a less important factor in the volitional phase that involves individuals enacting behaviors they are motivated to do. Thus, models that do not include variables associated with the volitional
phase (i.e., behavior enactment) may be unable to detect mediational effects between organizational factors and fidelity of implementation.

Moreover, based on TPB, in addition to attitude, subjective norms (i.e., an individual’s own perceptions and estimate of the social pressure and expectations to perform a given set of behaviors), and perceived behavioral control (i.e., an individual’s confidence or self-efficacy about being able to perform specific behaviors) both strongly predict one’s behavioral intention. Therefore, theoretically sound alternative mediational models can be built with subjective norms or perceived behavioral control mediating the relationship between organizational factors and implementation behavior (i.e., PATHS fidelity). For instance, implementation-specific climate can influence a teacher’s perceptions of the social pressure and expectation to implement EBPs, which in turn affects his/her implementation behavior of PATHS. Similarly, transactional leadership may influence teachers’ implementation behavior via a leader’s structure, guidance, and support which promotes teachers’ self-efficacy in deliver PATHS with fidelity.

Implications for Practice and Research

The findings from this study revealed implications for future school-based implementation research. First, this study demonstrates the importance of examining general and implementation-specific factors at the organizational and individual levels, as they lead to different interpretations of the relationship between variables. For example, while implementation-specific climate at the organizational level represents an average based on aggregating responses across individual teachers to provide an index of shared perceptions, when analyzed at the individual level it reflects each teacher’s perception of
the implementation climate. Thus, positive findings have different interpretations depending on the level at which they are measured (e.g., organizational or individual).

Second, the mixed findings based on the specific dimension of attitudes toward EBP has implications for research that aims to investigate the relationship between attitudes, organizational factors, and EBP implementation. Future research may want to adapt and use the EPBAS 50 version (Aaron et al., 2012), which includes additional subscales measuring other attitudinal dimensions. There is also implications for revising and improving upon the EBPAS to include additional malleable dimensions of attitudes consistent with the social-cognitive psychology literature, such as outcome expectancies and risk perceptions, which are common dimensions of attitudes assessed by health researchers (Fromme, 1997).

Third, the variance unaccounted for by the general and implementation-specific factors included in this study has implications for assessing other factors that are likely to create an organizational implementation context conducive for implementation. Other general and implementations-specific organizational factors such as collective efficacy, school culture, collaboration, and trust may reflect additional organizational constructs that are likely to have an influence on teacher attitudes toward and fidelity of implementation of universal EBPs. For example, collective efficacy has been extensively studied as the shared belief in a staff’s ability to produce desired outcomes (Olivier & Hipp, 2006; Tschannen-Moran & Barr, 2004).

Fourth, this study extended the evidence for an existing suite of psychometrically sound measures of organizational factors hypothesized to impact school-based implementation (i.e., School Implementation-Specific Climate Scale, School
Implementation-Specific Leadership Scale). One issue that needs to be considered is the high covariation among measures of general and implementation-specific leadership and climate in the current sample of elementary school teachers. The finding has implications for research to advance theoretical and measurement work that leads to a broader conceptualization of organizational factors, including general and implementation-specific factors, that results in tools that capture both factors as distinct yet related constructs that promote a healthy environment conducive to EBP implementation. For example, Louis’ seminal work (Louis, Murphy, & Smylie, 2016) on caring leadership represents an approach to better identify the general leadership qualities that contribute to a healthy work environment, while the work by Aarons and others (2006) continued work related to implementation-specific leadership helps increase clarity on its dimensions and how it is distinct yet related to general leadership. Developing more precise measures that capture the most salient characteristics of general leadership and implementation-specific leadership and climate will likely lead to measures that do not share excessive variance with one another and result in a better understanding of how they uniquely and additively influence successful EBP implementation.

Fifth, the significant interaction effect and main effects associated with individual-level general and implementation-specific leadership/climate points to the need for professional development and consultation for school administrators. There are interventions such as the Leadership for Organizational Change and Implementation (LOCI; Aarons, Ehrhart, Farahnak, & Hurlburt, 2015) that have been developed to improve both general and implementation-specific leadership as a way of promoting the adoption and delivery of EBPs. Moreover, because general and implementation-specific
organizational factors are associated with specific dimensions of teacher attitudes toward EBPs, future research needs to explore whether intentionally improving the leadership or climate leads to improvements in different dimensions of teacher attitudes toward EBPs which in turn influence implementation outcomes.

Sixth, data were gathered to evaluate the relationships among organizational factors, teacher attitudes toward EBPs and implementation outcomes. However, the fidelity variable in the current study only represented single dimension of fidelity (i.e., adherence), even though it is a multifaceted construct (i.e., adherence, dosage, quality/competence, and participant responsiveness; Di’Gennaro-Reed & Codding, 2014; Foreman et al., 2013; Shulte et al., 2009). Future research is needed to expand from the current findings to explore the effects of organizational factors, teacher attitudes toward EBPs on different dimensions of fidelity. It is possible that certain organizational factors have a larger association with certain dimensions of fidelity. For instance, implementation-specific leadership may associate more strongly with dosage than adherence, as teachers may perceive that leadership is more focused on delivering an EBP at the recommended amount than they are focused on delivering each of the steps as planned. As it remains, it is unclear whether organizational factors and attitudes toward EBP related differentially to certain dimensions of fidelity.

Seventh, fidelity is just one of many important implementation outcomes in school implementation research (e.g., adoption, feasibility, acceptability, and sustainability). It is theoretically plausible to assume different implementation outcomes would demonstrate varied patterns of cross-level associations with general and implementation-specific leadership and climate, as well as dimensions of teacher
attitudes. For example, researchers may find significant associations among (a) EBP Appeal and Divergence with acceptability; (b) Openness and EBP Requirement with adoption; (c) implementation-specific climate, leadership, and EBP Requirement with sustainment. These findings can inform more precise efforts to target organizational and individual factors in order to enhance specific implementation outcomes.

Last, the findings from the current study numerous implications for everyday implementation practice in the schools. First, the findings emphasize the importance of educational professionals attending to malleable factors within a given school setting (e.g., implementation-specific leadership behaviors and climate, teachers’ favorable attitudes toward EBPs) that are likely to enable or obstruct successful implementation of universal SEB EBPs in the school settings. For example, examining aspects of the school organizational implementation context inhibiting successful implementation will help facilitate efforts within a school to incrementally improve implementation through action planning (Lyon et al., 2018). Second, there is variability across and within schools depending on the type of universal EBP being implemented. There is a need for school systems to recognize the heterogeneity of implementation and deploy adaptive supports that are tailored to particular school settings or individuals within schools. Third, in many schools, climate is a catch-all term (Wang & Degol, 2016). However, this study suggests that climate must be better specified and assessed in a more strategic and focused manner to understand how people feel and think about their shared experiences in a given area of emphasis in the school (e.g., school safety vs. implementation).

Limitations and Directions for Future Research
The findings from this study should be interpreted in light of several limitations that call for future research. First, although the current study demonstrated sufficient, albeit modest, power for multilevel modeling, the sample size at the school level was relatively small ($N = 52$; SWPBIS $n = 39$ and PATHS $n = 13$). Future studies are needed with a larger sample of schools to operate with stronger power to enable more comprehensive model specifications and advanced analytic approaches. With a larger sample at both school and individual levels, a series of alternative multilevel models could be derived from the current ones to address additional research questions. For instance, general and implementation-specific climate and leadership can enter the model simultaneously to compare their differential associations with teacher attitudes toward EBPs. Also, the fixed effects of individual perceptions of organizational factors in the current study can be set random to examine potential between school variation of the effect of individual teacher’s perception of the organizational factors on their attitudes toward EBPs. Furthermore, school-level organizational factors can act as explanatory variables for the random effects of individual perceptions of the same factors in order to detect potential cross-level moderation effects. For instance, school-level implementation-specific climate may moderate the effect of individual-level teacher’s perception of the climate on their attitudes toward EBPs.

Second, a larger and more diverse sample of schools would enable for group invariance analysis to detect if the relationships among the variables examined in this study vary between different types of schools (e.g. urban versus rural, elementary versus secondary, private versus public, etc.) or groups of schools implementing different types of universal EBPs.
Third, the current study used two-level hierarchical linear modeling using the inter-correlated dimensions of teacher attitudes toward EBPs as separate individual DVs, which did not account for the significant correlations between the DVs. To enable accurate comparison of effects of organizational factors across different dimensions of attitudes simultaneously, a three-level multivariate multilevel model (MVMM; i.e., different dimensions of attitudes toward EBPs nested within individual teachers who are nested within schools) may be more suitable and powerful in simultaneously examining and comparing the cross-level associations between organizational factors and different dimensions of teacher attitudes toward EBPs (Baldwin, Imel, Braithwaite, & Atkins, 2014; Park, Pituch, Kim, Chung, & Dodd, 2015).

Fourth, the nature of secondary data analysis sets some fundamental limitations to the current study. For instance, the current study utilized a sample from urban elementary schools that were in the active implementation stage of universal EBPs. The external validity of the findings is therefore restricted to the active phase of implementation. Such research studies are called for to replicate, verify, and extend findings in the current study to other phases of the implementation. Moreover, the findings from this study are likely artifacts of the specific measures used. For example, it is possible that other measures of attitudes may provide a different picture of the relationship between organizational factors and attitudes. Additionally, there are other well-validated measures of general leadership and climate that exist (e.g., Vanderbilt Assessment of Leadership in Education: VAL-ED; Porter et al., 2008; and Comprehensive Assessment of Leadership for Learning: CALL; Camburn et al., 2012) that if used may uncover different associations with the other variables assessed in this study. Last, the fidelity metrics, in
particular, the Tiered Fidelity Inventory represents a school-wide measure of fidelity and does not capture individual teacher fidelity to specific SWPBIS practices. Having consistent fidelity measures at the individual teacher level that could also be aggregated up to the school-level may lead to different findings. Taken together, future studies need to verify these findings with similar and different measures of the constructs included in this study.

Fifth, the level 1 units of analysis represent teachers and their perceptions about organizational factors and their own attitudes toward EBPs. Thus, all inferences are about teacher perceptions and appraisals of leadership, climate, and their own attitudes toward EBPs. Future research should consider using a multi-informant approach to replicate and extend the findings in the current study based on responses of different types of personnel in the educational sector, such as administrators, consultants, school psychologists, paraprofessionals, social workers, and parents. Moreover, multi-methods such as observation, interviews, and review of permanent products may provide complementary data to examine organizational factors and artifacts that impact teacher attitudes toward EBPs and fidelity of implementation.

Sixth, the accuracy and reliability of the effect estimates were restricted by the adequacy of the data available. For instance, despite the remedial technics used (e.g., mean centering of predictors, bootstrapping), the multilevel and multiple regression models in the current study still demonstrated low to moderate level of multicollinearity due to the correlations between the general and implementation organizational factors. Multicollinearity may cause inaccurate estimates of coefficients and inflated standard errors and $p$ values (high false-negative rate) which in turn leads to missed significant
effects of certain organizational factors. Future studies can remedy the multicollinearity issue by increasing sample sizes at both levels for advanced analytic approaches. For instance, multilevel or multiple regression models with a larger sample (i.e., increased power) can catch the potentially overlooked effects of organizational variables in the current study. Principal components analysis and/or multilevel latent variable model (MLVM; Vermunt, 2008) can treat the correlated organizational variables as latent constructs to control for the multicollinearity.

Last, the current dataset contains data collected only in the Fall semester, which permitted a cross-sectional investigation. Implementation of EBPs in school settings is a complicated process that unfolds over time (Fixsen et al., 2005; Foreman et al., 2013). Given that implementation is a longitudinal, transactional process, research methods should attempt to gather data on organizational factors, teacher attitudes, and implementation outcomes over time. Longitudinal investigations are needed to collect and analyze multiple waves of school implementation data to explore the transactional effects and establish preliminary causal relationships from the organization context factors and individual attitudes to implementation outcomes of universal EBPs in schools.

**Conclusion**

Despite the presence of universal evidence-based programs and practices (EBPs) for use, implementation in real-world school settings is often incomplete or inadequate to produce meaningful changes in student outcomes (Owens et al., 2014). The current study provided preliminary evidence and mixed findings regarding the associations between general and implementation-specific organizational factors, different dimensions of teacher attitudes toward EBP, and fidelity of implementation of two different types of
universal EBPs. In sum, findings suggested that (a) significant associations between individual teacher’s perceptions of general and implementation-specific leadership and climate and their attitudes toward EBPs, providing evidence for the cross-level associations of school-level organizational factors, (b) general and implementation-specific organizational factors interact in their association with teachers’ perceptions of EBP appeal, and (c) general and implementation-specific factors combine to explain a moderate and meaningful amount of variance in fidelity of implementation of two approaches to universal prevention programming. This research revealed promising directions for future research that continues to explore how key constructs of the school organizational implementation context and individual implementers influence the successful uptake and delivery of universal EBPs. It is also hoped that findings from implementation research are translated into implementation practice or else the longstanding science-to-practice gap will likely persist.
Table 1

School-Level Demographic Information \((n=52)\)

<table>
<thead>
<tr>
<th>Sample Information</th>
<th>(n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>3</td>
</tr>
<tr>
<td>District</td>
<td>6</td>
</tr>
<tr>
<td>School</td>
<td>52</td>
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</tbody>
</table>

Universal Prevention Program

- SWPBIS: 39
- PATH: 13

School Demographics

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment</td>
<td>532</td>
<td>169.89</td>
<td>249</td>
<td>976</td>
</tr>
<tr>
<td>%White</td>
<td>38.84</td>
<td>20.59</td>
<td>0.1</td>
<td>79.5</td>
</tr>
<tr>
<td>%Mixed Race</td>
<td>9.25</td>
<td>3.75</td>
<td>0</td>
<td>17.5</td>
</tr>
<tr>
<td>% Pacific Islander</td>
<td>1.19</td>
<td>1.87</td>
<td>0</td>
<td>10.3</td>
</tr>
<tr>
<td>% Black/African American</td>
<td>15.13</td>
<td>25.23</td>
<td>0</td>
<td>97.7</td>
</tr>
<tr>
<td>% Asian</td>
<td>13.11</td>
<td>10.95</td>
<td>0</td>
<td>39.5</td>
</tr>
<tr>
<td>% Native</td>
<td>1.18</td>
<td>1.39</td>
<td>0</td>
<td>6.5</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>22.01</td>
<td>17.18</td>
<td>3</td>
<td>99</td>
</tr>
<tr>
<td>% ELL</td>
<td>18.54</td>
<td>13.1</td>
<td>2.7</td>
<td>49</td>
</tr>
<tr>
<td>% FRPL</td>
<td>15.1</td>
<td>6.3</td>
<td>3</td>
<td>47.1</td>
</tr>
</tbody>
</table>

Note. ELL = English Language Learner Program, FRPL = free and reduced-priced lunch program.
Table 2

_Educator-Level Demographics (N = 441)_

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Category Values</th>
<th>n (%)</th>
</tr>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 24 years old</td>
<td>21 (4.8)</td>
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</tr>
<tr>
<td>25 to 34 years old</td>
<td>129 (29.4)</td>
<td></td>
</tr>
<tr>
<td>35 to 44 years old</td>
<td>121 (27.6)</td>
<td></td>
</tr>
<tr>
<td>45 to 54 years old</td>
<td>103 (23.5)</td>
<td></td>
</tr>
<tr>
<td>55 to 64 years old</td>
<td>61 (13.9)</td>
<td></td>
</tr>
<tr>
<td>65 to 74 years old</td>
<td>4 (0.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>46 (10.5)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>391 (89.3)</td>
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</tr>
<tr>
<td>Other</td>
<td>1 (0.2)</td>
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</tr>
<tr>
<td><strong>Ethnicity</strong></td>
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</tr>
<tr>
<td>Latino/Hispanic</td>
<td>31 (7.1)</td>
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<tr>
<td>Non-Latino/Hispanic</td>
<td>407 (92.9)</td>
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</tr>
<tr>
<td><strong>Race</strong></td>
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</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>8 (1.8)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>6 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>22 (5.1)</td>
<td></td>
</tr>
<tr>
<td>Native Hawaiian or Pacific</td>
<td>1 (0.2)</td>
<td></td>
</tr>
<tr>
<td>Islander</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White or Caucasian</td>
<td>363 (83.8)</td>
<td></td>
</tr>
<tr>
<td>Multiracial</td>
<td>21 (4.8)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>12 (2.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Highest Degree Earned</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>140 (32.0)</td>
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<tr>
<td>Masters</td>
<td>297 (67.8)</td>
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<tr>
<td>Doctoral</td>
<td>1 (0.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Grade</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K – 2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>191 (43.3)</td>
<td></td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; – 5&lt;sup&gt;th&lt;/sup&gt; and other</td>
<td>250 (56.7)</td>
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</tr>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Years in Current Role</td>
<td>11.6</td>
<td>7</td>
</tr>
<tr>
<td>Years at Current School</td>
<td>6.9 ±</td>
<td>6</td>
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*Note. $M =$ Mean; $SD =$ Standard Deviation. No missing value exists in demographic variables, therefore the total $n$ for each variable is 441.*
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*Note. M = Mean; SD = Standard Deviation.*
Table 4

**Correlation Analysis Among All Key Variables in the Models**

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* p < 0.05
** p < 0.01
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Note. * p < .05; ** p < .01; N = 441; TYP = the type of universal EBP the school is currently implementing, value 0 = PATHS, value 1 = SWPBIS. FID = measure of implementation fidelity for different EBPs. ATT = individual teachers' attitudes toward Tier 1 EBPs as measured by EBPAS. ILS = implementation-specific leadership measured by SLIS; MLQ = general leadership measured by MLQ; ICS = implementation-specific climate measured by SICS; OHI = implementation-specific climate measured by OHI. REQ = Individual-level teachers' perceptions regarding if delivering EBPs is required; OPN = Individual-level teachers' perceptions regarding openness to delivering EBPs; APL = Individual-level teachers' perceptions regarding if delivering EBPs is found to be appealing; DVG = Individual-level teachers' perceptions that diverge from delivering EBPs.
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Note. ** $p < .01$; *** $p < .001$; Level 1: $N = 441$; Level 2: $N = 52$. The model # ending in 0 delineate all null models without adding predictors (covariates included).
Table 6

**Fixed Effect Coefficients of Hierarchical Linear Models for RQ 1**

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<th>S.E.</th>
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<th>Approx. df</th>
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Note. ** $p < .01$; *** $p < .001$; Level 1: $N = 441$; Level 2: $N = 52$. The model # ending in 1 delineate all null models without adding predictors (covariates included). The dependent/outcome variable is individual teachers' attitudes toward Tier 1 EBPs as measured by EBPAS. Symbols in parentheses represent the predictor’s corresponding coefficient in the model. Coef. = coefficient. GRD = Grade level the teacher served at; GEN = gender; EXP = educator’s experience in years, ENR = school level enrollment; S-ILS = school-level aggregated implementation-specific leadership measured by SLIS; S-MLQ = school-level aggregated general leadership measured by MLQ; S-ICS = school-level aggregated implementation-specific climate measured by SICS; S-OHI = school-level aggregated implementation-specific climate measured by OHI, ILS = individual-level implementation-specific leadership measured by SLIS; MLQ = individual-level general leadership measured by MLQ; ICS = individual-level implementation-specific climate measured by SICS; OHI = individual-level implementation-specific climate measured by OHI.
Table 7

**Fixed Effect Coefficients of Hierarchical Linear Models for RQ 2**

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<th>S.E.</th>
<th>T-ratio</th>
<th>Approx. df</th>
<th>p value</th>
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### 2.1.1 Leadership Interaction

**EBP Requirement**

**Intercept β₀**
- $Y_{00}$: 1.78, .65, 2.86, 48, .007
- $Y_{(S-ILS)01}$: .45, .24, 1.87, 48, .07
- $Y_{(S-MLQ)02}$: -.03, .32, -.10, 48, .92
- $Y_{(S-INT-L)03}$: -.13, .09, -1.37, 48, .18

**Slope β₁**
- $Y_{(ILS)10}$: .02, .16, .12, 434, .91

**Slope β₂**
- $Y_{(MLQ)20}$: .11, .14, .74, 434, .46

**Slope β₃**
- $Y_{(INT-L)30}$: .07, .05, 1.38, 434, .17
- $Y_{00}$: .33, 1.60, .21, 48, .84

**Intercept β₀**
- $Y_{(S-ICS)01}$: .71, .87, .72, 48, .42
- $Y_{(S-OHI)02}$: .07, .59, .12, 48, .91
- $Y_{(S-INT-C)03}$: -.14, .29, -.83, 48, .41

**Slope β₁**
- $Y_{(ICS)10}$: .41, .38, 1.09, 434, .28

**Slope β₂**
- $Y_{(OHI)20}$: .66, .30, 2.22, 434, .03

**Slope β₃**
- $Y_{(INT-C)30}$: -.06, .12, -.46, 434, .65

### 2.1.2 Climate Interaction

### 2.2.1 Leadership Interaction

**EBP Openness**

**Intercept β₀**
- $Y_{00}$: 2.49, .35, 7.17, 47, <.001
- $Y_{(ENR)01}$: .0005, .0002, 3.12, 47, .003

**Slope β₁**
- $Y_{(GRD)10}$: -.18, .06, -2.88, 431, .005

**Slope β₂**
- $Y_{(EXP)20}$: -.01, .003, -3.47, 431, .001

**Slope β₃**
- $Y_{(ILS)30}$: .12, .16, .71, 431, .48

**Slope β₄**
- $Y_{(MLQ)40}$: -.07, .15, -.47, 431, .64

**Slope β₅**
- $Y_{(INT-L)50}$: .08, .05, 1.46, 431, .15
### 2.2.2 Climate Interaction

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### 2.3.1 Leadership Interaction

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### 2.3.2 Climate Interaction

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<td>Slope $\beta_5$</td>
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*Note.* **$p < .01$; ***$p < .001$; Level 1: $N = 441$; Level 2: $N = 52$. The model # ending in 1 delineate all null models without adding predictors (covariates included). The dependent/outcome variable is individual teachers’ attitudes toward Tier 1 EBPs as measured by EBPAS. Symbols in parentheses represent the predictor’s corresponding coefficient in the model. Coef. = coefficient. GRD = Grade level the teacher served at; GEN = gender; EXP = educator’s experience in years, ENR = school level enrollment; S-ILS = school-level aggregated implementation-specific leadership measured by SLIS; S-MLQ = school-level aggregated general leadership measured by MLQ; S-ICS = school-level aggregated implementation-specific climate measured by SICS; S-OHI = school-level aggregated implementation-specific climate measured by OHI, S-INT-L = school-level interaction terms created by the multiplication of S-ILS and S-MLQ; S-INT-C = school-level interaction terms created by the multiplication of S-ICS and S-OHI; ILS = individual-level implementation-specific leadership measured by SLIS; MLQ = individual-level general leadership measured by MLQ; ICS = individual-level implementation-specific climate measured by SICS; OHI = individual-level implementation-specific climate measured by OHI. INT-L = individual-level interaction terms created by the multiplication of ILS and MLQ; INT-C = individual-level interaction terms created by the multiplication of ICS and OHI;
Table 8

Coefficient Estimates of Multiple Regression Models

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<tr>
<th>Model #</th>
<th>Y</th>
<th>X</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>R²</th>
<th>95% CI of R²</th>
<th>F</th>
<th>p</th>
<th>R² Adjusted</th>
<th>f²</th>
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<td>.11</td>
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<td>S-OHI</td>
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<td>S-ILS</td>
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### PATHS Models with Individual Level Data (n = 93)

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<th>β</th>
<th>t</th>
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<th>R²</th>
<th>95% CI of R²</th>
<th>F</th>
<th>p</th>
<th>R² Adjusted</th>
<th>( f^2 )</th>
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<td>.12**</td>
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<td>.08*</td>
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**Note.** *p < .05; **p < .01; ***p < .001; Theoretically, although the R² can never fall below zero, the 95% CI (confidence interval) which contained negative R² was calculated using standard error of estimates to guide interpretation of the effect size.

\( \beta \) stands for standardized regression coefficient. Y = Outcome variable, X = organizational factor. Outcome variables include S-FID = school-level implementation fidelity for EBPs; S-REQ = school-level aggregated teachers’ perceptions regarding if delivering EBPs is required as measured by relevant items in the EBPAS. Predictors include S-ILS = school-level aggregated implementation-specific leadership measured by SLIS; S-MLQ = school-level aggregated general leadership measured by MLQ; S-ICS = school-level aggregated implementation-specific climate measured by SICS; S-OHI = school-level aggregated implementation-specific climate measured by OHI.
Table 9

Specifications and Coefficients of the Mediation Models

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<th>X</th>
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<th>Indirect/mediation Effect</th>
<th>Indirect effect 95% CI</th>
<th>Total Effect</th>
<th>Ratio of Indirect to Total Effect</th>
<th>Mediation Type</th>
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<td>.041***</td>
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<td>.007</td>
<td>-.0028, .0194</td>
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<td>-.0039, .0168</td>
<td>.035**</td>
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<td>No</td>
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</table>

Note. N = 93; * p < .05; ** p < .01; *** p < .001; N = 93; Coef. = coefficient; Symbols in parentheses represent the variable’s corresponding coefficient in the model. Due to the generally small size of coefficients, three decimals are reported here. Configuration of the model numbers: the first digit indicates the research questions number (i.e. 4), the second digit indicates the predictor (1 = Implementation-specific Leadership; 2 = General Leadership; 3 = Implementation-specific Climate; and 4 = General Climate). Outcome variable FID = teacher level implementation fidelity of PATHS. Mediators are REQ = teacher level teachers' perceptions regarding if delivering EBPs is required as measured by the EBPAS. Predictors include ILS = teacher level implementation-specific leadership measured by SLIS; MLQ = teacher level general leadership measured by MLQ; ICS = teacher level implementation-specific climate measured by SICS; OHI = teacher level implementation-specific climate measured by OHI.
Figures

Figure 1. $N = 52$. The level-2 interaction effect between general and implementation-specific leadership on the school mean score of EBP Appeal. S-MLQ = school level aggregated teachers’ perception of the general leadership measured by MLQ. S-ILS = school level aggregated teachers’ perception of implementation-specific leadership measured by SLIS.
Figure 2. $N = 441$. The level-1 interaction effect between general and implementation-specific leadership on the outcome variable of EBP Appeal. MLQ = individual teachers’ perception of the general leadership measured by MLQ. ILS = individual teachers’ perception of implementation-specific leadership measured by SLIS.
Figure 3. $N = 52$. The level-2 interaction effect between general and implementation-specific climate on the school mean score of EBP Appeal. S-ICS = school-level aggregated implementation-specific climate measured by SICS; S-OHI = school-level aggregated implementation-specific climate measured by OHI.
**Figure 4.** $N = 441$. The level-1 interaction effect between general and implementation-specific climate on the outcome variable of EBP Appeal.

OHI= individual teachers’ perception of the general climate measured by OHI. ILS = individual teachers’ perception of implementation-specific climate measured by SICS.
**Figure 5.** $N = 93$. * $p < .05$ ** $p < .01$, *** $p < .001$. (a) use Suspension Rate per Student as Outcome, (b) uses Reading Proficiency Rate as outcome. All beta coefficients are bootstrapping estimations. Where $\beta_a = \text{the beta coefficient of the Predictor regressing on the mediator}$, $\beta_b$ is the beta for the mediator. Outcome with Predictor in the equation, $\beta_c$ is the coefficient for the Predictor when the mediator is in the equation, and $\beta_d$ is the coefficient for the Predictor when the mediator has not been entered. Outcome variable FID = the individual-level fidelity in implementation of EBPs. Mediator is REQ = individual-level teachers’ perceptions regarding if delivering EBPs is required. ILS = individual-level implementation-specific leadership measured by SLIS.

**Figure 6.** $N = 93$. * $p < .05$ ** $p < .01$, *** $p < .001$. (a) use Suspension Rate per Student as Outcome, (b) uses Reading Proficiency Rate as outcome. All beta coefficients are bootstrapping estimations. Where $\beta_a = \text{the beta coefficient of the Predictor regressing on the mediator}$, $\beta_b$ is the beta for the mediator. Outcome with Predictor in the equation, $\beta_c$ is the coefficient for the Predictor when the mediator is in the equation, and $\beta_d$ is the coefficient for the Predictor when the mediator has not been entered. Outcome variable FID = the individual-level fidelity in implementation of EBPs. Mediator is REQ = individual-level teachers’ perceptions regarding if delivering EBPs is required as measured by EBPAS. MLQ = individual-level general leadership measured by MLQ.
Figure 7. N = 93. * p < .05 ** p < .01, *** p < .001. (a) use Suspension Rate per Student as Outcome, (b) uses Reading Proficiency Rate as outcome. All beta coefficients are bootstrapping estimations. Where $\beta_a =$ the beta coefficient of the Predictor regressing on the mediator, $\beta_b$ is the beta for the mediator. Outcome with Predictor in the equation, $\beta_c$ is the coefficient for the Predictor when the mediator is in the equation, and $\beta_d$ is the coefficient for the Predictor when the mediator has not been entered. Outcome variable $\text{FID} =$ the individual-level fidelity in implementation of EBPs. Mediator is $\text{REQ} =$ individual-level teachers’ perceptions regarding if delivering EBPs is required. $\text{ICS} =$ individual-level implementation-specific climate measured by SICS.
Equations

Null Model 1.1.0
Level 1 Equation \((n = 441)\)
\[ \text{REQ}_{ij} = \beta_0 + \beta_1 \ast (\text{GRD}) + \beta_2 \ast (\text{AGE}) + \beta_3 \ast (\text{GEN}) + \beta_4 \ast (\text{EXP}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \ast (\text{ENR}) + \gamma_{02} \ast (\text{DIV}) + \gamma_{03} \ast (\text{FRPL}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]

Leadership Model 1.1.1
Level 1 Equation \((n = 441)\)
\[ \text{REQ}_{ij} = \beta_0 + \beta_1 \ast (\text{ILS}) + \beta_2 \ast (\text{MLQ}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \ast (S - \text{ILS}) + \gamma_{02} \ast (S - \text{MLQ}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]

Climate Model 1.1.2
Level 1 Equation \((n = 441)\)
\[ \text{REQ}_{ij} = \beta_0 + \beta_1 \ast (\text{ICS}) + \beta_2 \ast (\text{OHI}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \ast (S - \text{ICS}) + \gamma_{02} \ast (S - \text{OHI}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]

Null Model 1.2.0
Level 1 Equation \((n = 441)\)
OPN_{ij} = \beta_0 + \beta_1 \cdot (GRD) + \beta_2 \cdot (AGE) + \beta_3 \cdot (GEN) + \beta_4 \cdot (EXP) + r_{ij}

**Level 2 Equation (n = 52)**
\[ \beta_0 = \gamma_{00} + \gamma_{01} \cdot (ENR) + \gamma_{02} \cdot (DIV) + \gamma_{02} \cdot (FRPL) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]

**Leadership Model 1.2.1**

**Level 1 Equation (n = 441)**
OPN_{ij} = \beta_0 + \beta_1 \cdot (GRD) + \beta_2 \cdot (EXP) + \beta_3 \cdot (ILS) + \beta_4 \cdot (MLQ) + r_{ij}

**Level 2 Equation (n = 52)**
\[ \beta_0 = \gamma_{00} + \gamma_{01} \cdot (ENR) + \gamma_{02} \cdot (S-ILS) + \gamma_{03} \cdot (S-MLQ) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]

**Climate Model 1.2.2**

**Level 1 Equation (n = 441)**
OPN_{ij} = \beta_0 + \beta_1 \cdot (GRD) + \beta_2 \cdot (EXP) + \beta_3 \cdot (ICS) + \beta_4 \cdot (OHI) + r_{ij}

**Level 2 Equation (n = 52)**
\[ \beta_0 = \gamma_{00} + \gamma_{01} \cdot (ENR) + \gamma_{02} \cdot (S-ICS) + \gamma_{03} \cdot (S-OHI) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]

**Null Model 1.3.1**
Level 1 Equation \((n = 441)\)
\[ \text{APL}_{ij} = \beta_0 + \beta_1 \times (\text{GRD}) + \beta_2 \times (\text{AGE}) + \beta_3 \times (\text{GEN}) + \beta_4 \times (\text{EXP}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{ENR}) + \gamma_{02} \times (\text{DIV}) + \gamma_{02} \times (\text{FRPL}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]

Leadership Model 1.3.1
Level 1 Equation \((n = 441)\)
\[ \text{APL}_{ij} = \beta_0 + \beta_1 \times (\text{GEN}) + \beta_2 \times (\text{EXP}) + \beta_3 \times (\text{ILS}) + \beta_4 \times (\text{MLQ}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{ENR}) + \gamma_{02} \times (\text{S} - \text{ILS}) + \gamma_{03} \times (\text{S} - \text{MLQ}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]

Climate Model 1.3.2
Level 1 Equation \((n = 441)\)
\[ \text{APL}_{ij} = \beta_0 + \beta_1 \times (\text{GEN}) + \beta_2 \times (\text{EXP}) + \beta_3 \times (\text{ICS}) + \beta_4 \times (\text{OHI}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{ENR}) + \gamma_{02} \times (\text{S} - \text{ICS}) + \gamma_{03} \times (\text{S} - \text{OHI}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]
Leadership Interaction Model 2.1.1
Level 1 Equation \((n = 441)\)
\[
\text{REQ}_{ij} = \beta_0 + \beta_1 \ast (\text{ILS}) + \beta_2 \ast (\text{MLQ}) + \beta_3 \ast (\text{INT} - \text{L}) + r_{ij}
\]

Level 2 Equation \((n = 52)\)
\[
\beta_0 = \gamma_{00} + \gamma_{01} \ast (S - \text{ILS}) + \gamma_{02} \ast (S - \text{MLQ}) + \gamma_{03} \ast (S - \text{INT} - \text{L}) + \mu_{0j}
\]
\[
\beta_1 = \gamma_{10}
\]
\[
\beta_2 = \gamma_{20}
\]
\[
\beta_3 = \gamma_{30}
\]

Climate Interaction Model 2.1.2
Level 1 Equation \((n = 441)\)
\[
\text{REQ}_{ij} = \beta_0 + \beta_1 \ast (\text{ICS}) + \beta_2 \ast (\text{OHI}) + \beta_3 \ast (\text{INT} - \text{C}) + r_{ij}
\]

Level 2 Equation \((n = 52)\)
\[
\beta_0 = \gamma_{00} + \gamma_{01} \ast (S - \text{ICS}) + \gamma_{02} \ast (S - \text{OHI}) + \gamma_{03} \ast (S - \text{INT} - \text{C}) + \mu_{0j}
\]
\[
\beta_1 = \gamma_{10}
\]
\[
\beta_2 = \gamma_{20}
\]
\[
\beta_3 = \gamma_{30}
\]

Leadership Interaction Model 2.2.1
Level 1 Equation \((n = 441)\)
\[
\text{OPN}_{ij} = \beta_0 + \beta_1 \ast (\text{GRD}) + \beta_2 \ast (\text{EXP}) + \beta_3 \ast (\text{ILS}) + \beta_4 \ast (\text{MLQ}) + \beta_5 \ast (\text{INT} - \text{L}) + r_{ij}
\]

Level 2 Equation \((n = 52)\)
\[
\beta_0 = \gamma_{00} + \gamma_{01} \ast (\text{ENR}) + \gamma_{02} \ast (S - \text{ILS}) + \gamma_{03} \ast (S - \text{MLQ}) + \gamma_{04} \ast (S - \text{INT} - \text{L}) + \mu_{0j}
\]
\[
\beta_1 = \gamma_{10}
\]
\[
\beta_2 = \gamma_{20}
\]
\[
\beta_3 = \gamma_{30}
\]
\[
\beta_4 = \gamma_{40}
\]
\[
\beta_5 = \gamma_{50}
\]
Climate Interaction Model 2.2.2
Level 1 Equation \((n = 441)\)
\[ \text{OPN}_{ij} = \beta_0 + \beta_1 \times (\text{GRD}) + \beta_2 \times (\text{EXP}) + \beta_3 \times (\text{ICS}) + \beta_4 \times (\text{OHI}) + \beta_5 \times (\text{INT} - \text{C}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{ENR}) + \gamma_{02} \times (\text{S} - \text{ICS}) + \gamma_{03} \times (\text{S} - \text{OHI}) + \gamma_{04} \times (\text{S} - \text{INT} - \text{C}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]
\[ \beta_5 = \gamma_{50} \]

Leadership Interaction Model 2.3.1
Level 1 Equation \((n = 441)\)
\[ \text{APL}_{ij} = \beta_0 + \beta_1 \times (\text{GEN}) + \beta_2 \times (\text{EXP}) + \beta_3 \times (\text{ILS}) + \beta_4 \times (\text{MLQ}) + \beta_5 \times (\text{INT} - \text{L}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{ENR}) + \gamma_{02} \times (\text{S} - \text{ILS}) + \gamma_{03} \times (\text{S} - \text{MLQ}) + \gamma_{04} \times (\text{S} - \text{INT} - \text{L}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]
\[ \beta_5 = \gamma_{50} \]

Climate Interaction Model 2.3.2
Level 1 Equation \((n = 441)\)
\[ \text{APL}_{ij} = \beta_0 + \beta_1 \times (\text{GEN}) + \beta_2 \times (\text{EXP}) + \beta_3 \times (\text{ICS}) + \beta_4 \times (\text{OHI}) + \beta_5 \times (\text{INT} - \text{C}) + r_{ij} \]

Level 2 Equation \((n = 52)\)
\[ \beta_0 = \gamma_{00} + \gamma_{01} \times (\text{ENR}) + \gamma_{02} \times (\text{S} - \text{ICS}) + \gamma_{03} \times (\text{S} - \text{OHI}) + \gamma_{04} \times (\text{S} - \text{INT} - \text{C}) + \mu_{0j} \]
\[ \beta_1 = \gamma_{10} \]
\[ \beta_2 = \gamma_{20} \]
\[ \beta_3 = \gamma_{30} \]
\[ \beta_4 = \gamma_{40} \]
\[ \beta_5 = \gamma_{50} \]

**SWPBIS Model 3.1 \( (n = 39) \)**

**Leadership Model:**
\[ S-FID = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (S-ILS) + \beta_4 \times (S-MLQ) + r_j \]

**Climate Model:**
\[ S-FID = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (S-ICS) + \beta_4 \times (S-OHI) + r_j \]

**SWPBIS Model 3.2 \( (n = 39) \)**

**Leadership Model:**
\[ S-REQ = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (S-ILS) + \beta_4 \times (S-MLQ) + r_j \]

**Climate Model:**
\[ S-REQ = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (S-ICS) + \beta_4 \times (S-OHI) + r_j \]

**SWPBIS Model 3.3 \( (n = 39) \)**

**Leadership Model:**
\[ S-FID = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (S-ILS) + \beta_4 \times (S-MLQ) + \beta_5 \times (S-REQ) + r_j \]

**Climate Model:**
\[ S-FID = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (S-ILS) + \beta_4 \times (S-MLQ) + \beta_5 \times (S-REQ) + r_j \]

**PATHS Model 3.1 \( (n = 93) \)**

**Leadership Model:**
\[ FID = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (ILS) + \beta_4 \times (MLQ) + r_j \]

**Climate Model:**
\[ FID = \beta_0 + \beta_1 \times (ENR) + \beta_2 \times (DIV) + \beta_3 \times (ICS) + \beta_4 \times (OHI) + r_j \]

**PATHS Model 3.2 \( (n = 93) \)**
Leadership Model:
$\text{REQ} = \beta_0 + \beta_1 \times (\text{ENR}) + \beta_2 \times (\text{DIV}) + \beta_3 \times (\text{ILS}) + \beta_4 \times (\text{MLQ}) + r_j$

Climate Model:
$\text{REQ} = \beta_0 + \beta_1 \times (\text{ENR}) + \beta_2 \times (\text{DIV}) + \beta_3 \times (\text{ICS}) + \beta_4 \times (\text{OHI}) + r_j$

PATHS Model 3.3 ($n = 93$)
Leadership Model:
$\text{FID} = \beta_0 + \beta_1 \times (\text{ENR}) + \beta_2 \times (\text{DIV}) + \beta_3 \times (\text{ILS}) + \beta_4 \times (\text{MLQ}) + \beta_5 \times (\text{REQ}) + r_j$

Climate Model:
$\text{FID} = \beta_0 + \beta_1 \times (\text{ENR}) + \beta_2 \times (\text{DIV}) + \beta_3 \times (\text{ILS}) + \beta_4 \times (\text{MLQ}) + \beta_5 \times (\text{REQ}) + r_j$
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Appendix A

Multifactor Leadership Questionnaire

Purpose: This questionnaire is to describe the leadership style of an individual.

Subscale Score: Mean of the item scores. Subscales: Contingent Reward, Intellectual Stimulation, Management-by-Exception (Active), Idealized Influence (Behavior), Inspirational Motivation, Idealized Influence (Attributed), Individualized Consideration, Extra Effort.

Subscale Total (Sub_Tot)= Sum(item scores)/(number of items in subscale; 3 or 4 items)

Subscales:
- Contingent Reward
  Items: 1,11,16,35
  Score: Sum(1,11,16,35)/4

- Intellectual Stimulation
  Items:2,8,30,32
  Score: Sum(2,8,30,32)/4

- Management-by-Exception (Active)
  Items: 4,22,24,27
  Score: Sum(4,22,24,27)/4

- Idealized Influence (Behavior)
  Items: 6,14,23,34
  Score: Sum(6,14,23,34)/4

- Inspirational Motivation
  Items: 9,13,26,36
  Score: Sum(9,13,26,36)/4

- Idealized Influence (Attributed)
  Items: 10,18,21,25
  Score: Sum(10,18,21,25)/4

- Individualized Consideration
  Items: 15,19,29,31
  Score: Sum(15,19,29,31)/4

- Extra Effort
  Items: 39, 42, 44
  Score: Sum(39, 42, 44)/3

<table>
<thead>
<tr>
<th>#</th>
<th>Items</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provides me with assistance in exchange for my efforts.</td>
<td>0=Not at All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=Once in a while</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=Sometimes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=Fairly often</td>
</tr>
<tr>
<td>2</td>
<td>Re-examines critical assumptions to question whether they are</td>
<td></td>
</tr>
<tr>
<td></td>
<td>appropriate.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4=Frequently, if not always</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>3.</td>
<td>Focuses attention on irregularities, mistakes, exceptions, and deviations from standards.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Talks about their most important values and beliefs.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Seeks differing perspectives when solving problems.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Talks optimistically about the future.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Instills pride in me for being associated with him/her.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Discusses in specific terms who is responsible for achieving performance targets.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Talks enthusiastically about what needs to be accomplished.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Specifies the importance of having a strong sense of purpose.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Spends time teaching and coaching.</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Makes clear what one can expect to receive when performance goals are achieved.</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Treats me as an individual rather than just as a member of a group.</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Acts in ways that builds my respect.</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Concentrates his/her full attention on dealing with mistakes, complaints, and failures.</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Considers the moral and ethical consequences of decisions.</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Keeps track of all mistakes.</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Displays a sense of power and confidence.</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Articulates a compelling vision of the future.</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Directs my attention toward failures to meet standards.</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Considers me as having different needs, abilities, and aspirations from others.</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Gets me to look at problems from many different angles.</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Helps me to develop my strengths.</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Suggests new ways of looking at how to complete assignments.</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Emphasizes the importance of having a collective sense of mission.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Implementation-specific leadership Scale

Purpose: The ILS assesses the degree to which a leader is Proactive, Knowledgeable, Supportive, and Perseverant in implementing evidence-based practice.

Total Score: Mean of all the scale scores. Scales are: Proactive, Knowledgeable, Supportive, Perseverant, Communication, Vision/Mission, Availability

Subscales:
Proactive
Items: 1,2,3
Score: Sum(1,2,3)/(number of answered items; 1,2 or 3)

Knowledgeable
Items: 4,5,6
Score: Sum(4,5,6)/(number of answered items; 1,2 or 3)

Supportive
Items: 8,9,11
Score: Sum(8,9,11)/(number of answered items; 1,2 or 3)

Perseverant
Items: 13,14,15
Score: Sum(13,14,15)/(number of answered items; 1,2 or 3)

Communication
Items: 18,19,20
Score: Sum(18,19,20)/(number of answered items; 1,2 or 3)

Vision/Mission
Items: 23,24,25
Score: Sum(23,24,25)/(number of answered items; 1,2 or 3)

Availability
Items: 28,29,30
Score: Sum(28,29,30)/(number of answered items; 1,2 or 3)

<table>
<thead>
<tr>
<th>#</th>
<th>Items</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Our principal has developed a plan to facilitate implementation of EBP.</td>
<td>0=Not at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=Slight extent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=Moderate extent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=Great extent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4=Very great extent</td>
</tr>
<tr>
<td>2.</td>
<td>Our principal has removed obstacles to the implementation of EBP.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Our principal has established clear school standards and expectations for the implementation of EBP.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Our principal is knowledgeable about EBP.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Our principal is able to answer questions about EBP.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Our principal knows what he or she is talking about when it comes to EBP.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Our principal recognizes and appreciates teacher/school staff efforts toward successful implementation of EBP.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Our principal supports teacher/school staff efforts to learn more about EBP.</td>
<td></td>
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<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Our principal supports teacher/school staff efforts to use EBP.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Our principal carries on through the challenges of implementing EBP.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Our principal effectively addresses critical issues regarding the implementation of EBP.</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Our principal consistently supports EBP implementation when confronted with setbacks.</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Our principal establishes clear communication systems about EBP.</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Our principal talks about EBP.</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Our principal encourages others to communicate with her/him about EBP implementation.</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Our principal links the implementation of EBP to improved student outcomes.</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Our principal has a clear vision for the implementation of EBP in this school.</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Our principal connects EBP to the broader mission of our school.</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Our principal is accessible if I need help with implementing EBP.</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Our principal is available to discuss implementation of EBP.</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>If I have a problem or concern regarding EBP, I can contact our principal.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Organizational Health Inventory for Elementary Schools

**Purpose:** A healthy school is one in which the institutional, administrative, and teacher levels are in harmony; and the school meets functional needs as it successfully copes with disruptive external forces and directs its energies toward its mission.

**Subscale Score:** Sum the items in each subscale. Scales are: Academic Emphasis, Teacher Affiliation, Institutional Integrity
Subscale Total (Sub_Tot)=Sum(items; number of items 5,6, or 9)

**Subscales:**
- **Academic Emphasis**
  - Items: 6,7,18,24,31
  - Score: Sum(6,7,18,24,31)
  - Reverse score: 6
- **Institutional Integrity**
  - Items: 8,14,19,25,29,30
  - Score: Sum(8,14,19,25,29,30)
  - Reverse score: 8,14,19,25,29,30
- **Teacher Affiliation**
  - Items: 13, 23, 27, 28, 32, 33, 35, 36, 37
  - Score: Sum(13, 23, 27, 28, 32, 33, 35, 36, 37)
  - Reverse score: 37

<table>
<thead>
<tr>
<th>#</th>
<th>Items</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students neglect to complete homework.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Students are cooperative during classroom instruction.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The school is vulnerable to outside pressures.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Teachers in this school like each other.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Community demands are accepted even when they are not consistent with the educational program.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Students respect others who get good grades.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Teachers feel pressure from the community.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Teachers exhibit friendliness to each other.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Students seek extra work so they can get good grades.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Select citizen groups are influential with the board.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Teachers express pride in their school.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Select citizen groups are influential with the board.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Teachers express pride in their school.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Teachers identify with the school.</td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
</tr>
<tr>
<td>15.</td>
<td>The school is open to the whims of the public.</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>A few vocal parents can change school policy.</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Students try hard to improve on previous work.</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Teachers accomplish their jobs with enthusiasm.</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>The learning environment is orderly and serious.</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>There is a feeling of trust and confidence among the staff.</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Teachers show commitment to their students.</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Teachers are indifferent to each other.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Implementation-specific climate Scale

**Purpose:** This measure assesses employees’ shared perceptions of the policies, practices, procedures, and behaviors that are rewarded, supported, and expected in order to facilitate effective EBP implementation.

**Total Score:** Mean of all the scale scores. Scales are: Focus, Educational Support, Recognition, Rewards, Use of Data, Existing Supports, Integration
ICS Total \( (S_{ICS\_Tot}) = \text{Sum}(\text{Focus, Educational Support, Recognition, Rewards, Use of Data, Existing Supports, Integration})/(\text{number if subscales; 7}) \)

**Subscales:**

- **Focus**
  - Items: 1, 2, 3
  - Score: \( \text{Sum}(1,2,3)/(\text{number of answered items; 1,2 or 3}) \)

- **Educational Support**
  - Items: 4, 5, 6
  - Score: \( \text{Sum}(4,5,6)/(\text{number of answered items; 1,2 or 3}) \)

- **Recognition**
  - Items: 7, 8, 9
  - Score: \( \text{Sum}(7,8,9)/(\text{number of answered items; 1,2 or 3}) \)

- **Rewards**
  - Items: 10, 11, 12
  - Score: \( \text{Sum}(10,11,12)/(\text{number of answered items; 1,2 or 3}) \)

- **Use of Data**
  - Items: 14, 15, 16
  - Score: \( \text{Sum}(14,15,16)/(\text{number of answered items; 1,2 or 3}) \)

- **Existing Supports**
  - Items: 17, 18, 19
  - Score: \( \text{Sum}(17,18,19)/(\text{number of answered items; 1,2 or 3}) \)

- **Integration**
  - Items 20, 21, 23
  - Score: \( \text{Sum}(20,21,23)/(\text{number of answered items; 1,2 or 3}) \)

<table>
<thead>
<tr>
<th>#</th>
<th>Items</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>One of this school’s main goals is to use EBP effectively.</td>
<td>0=Not at all 1=slight extent 2=moderate extent 3=Great extent 4=Very great extent</td>
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<tr>
<td>2.</td>
<td>People in this school believe that the implementation of EBP is important.</td>
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<td>3.</td>
<td>Using EBP is a top school priority.</td>
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<td>4.</td>
<td>This school supports attendance at conferences, workshops, or seminars focusing on EBP.</td>
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<td>5.</td>
<td>This school provides EBP training or in-services.</td>
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<td>6.</td>
<td>This school provides EBP materials (e.g., lesson plans, literature, etc.).</td>
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<td>7.</td>
<td>Teachers/school staff who use EBP are seen as experts.</td>
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<td>8.</td>
<td>Teachers/school staff who use EBP are held in high esteem in this school.</td>
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<td>9.</td>
<td>Teachers/school staff who use EBP are more likely to be recommended for career development opportunities (e.g., recognized as an exemplar, promoted to another position, etc.).</td>
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<td>10.</td>
<td>This school provides small perks or incentives (e.g., coffee cards) to teachers/school staff who use EBP.</td>
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<td>11.</td>
<td>The teachers/school staff who are better at using EBP, are more likely to get additional resources to support their work.</td>
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<td>12.</td>
<td>This school provides opportunities to accumulate extra release time or reductions in other duties for the use of EBP.</td>
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<td>13.</td>
<td>In this school, teachers/school staff review data on barriers to EBP implementation to problem solve and develop action plans.</td>
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<td>14.</td>
<td>This school collects data about how well EBP is being implemented (e.g., fidelity assessments).</td>
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<td>15.</td>
<td>This school provides data-driven feedback to staff about their delivery of EBP.</td>
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<td>16.</td>
<td>This school uses professional development time to support staff to use EBP over time.</td>
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<td>17.</td>
<td>This school provides follow-up support after professional development to help teachers/school staff deliver EBP with fidelity.</td>
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<td>18.</td>
<td>This school devotes structured meetings (e.g., professional learning communities, grade-level meetings) to problem-solve delivering EBP with fidelity.</td>
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<td>19.</td>
<td>This school’s continuous improvement efforts integrate the use of EBP.</td>
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<td>20.</td>
<td>This school connects implementation of EBP to teachers'/school staff’s performance evaluations.</td>
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<tr>
<td>21.</td>
<td>This school integrates the implementation of EBP with other ongoing work.</td>
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Appendix E

Evidence-Based Practice Attitude Scale

**Purpose:** This measure assesses feelings about using new types of teaching methods, interventions, or treatments.

**Scoring and Tabulation:**
Responses are based on a 5-point Likert scale:
0=Not at all
1=Slight extent
2=Moderate extent
3=Great extent
4=Very great extent

**Total Score:** Mean of all the scale scores. Scales are: Openness, Divergence, Appealing, Required, Fit, Burden
EBPAS Total (S_EBPAS_Tot) = Sum(Openness, Divergence, Appealing, Required, Fit, Burden)/(number if subscales; 6)

**Subscales:**
- **Openness**
  Items: 1, 2, 4, 8
  Score: Sum(1, 2, 4, 8)/(number of answered items; 1, 2, 3, or 4)
- **Divergence**
  Items: 3, 5, 6, 7
  Score: Sum(3, 5, 6, 7)/(number of answered items; 1, 2, 3, or 4)
  Items 3 and 6 are reverse scored
- **Appealing**
  Items: 9, 10, 14, 15
  Score: Sum(9, 10, 14, 15)/(number of answered items; 1, 2, 3, or 4)
- **Required**
  Items: 11, 12, 13
  Score: Sum(11, 12, 13)/(number of answered items; 1, 2 or 3)
- **Fit**
  Items: 16, 17, 18, 19, 20, 21, 22
  Score: Sum(16, 17, 18, 19, 20, 21, 22)/(number of answered items; 1, 2, 3, 4, 5, 6 or 7)
- **Burden**
  Items: 23, 24, 25, 26
  Score: Sum(23, 24, 25, 26)/(number of answered items; 1, 2, 3, or 4)
  Items 24 and 26 are reverse scored

<table>
<thead>
<tr>
<th>#</th>
<th>Item</th>
<th>Values</th>
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<tbody>
<tr>
<td>1.</td>
<td>I like to use EBP practices to help my students.</td>
<td>0=Not at all</td>
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</tbody>
</table>
|   | I am willing to try new types of EBP even if I have to follow specific steps. | 1=Slight extent  
2=Moderate extent  
3=Great extent  
4=Very great extent |
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<tr>
<td>3.</td>
<td>I know better than academic researchers how to support my students.</td>
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<td>4.</td>
<td>I am willing to use new and different types of EBP developed by researchers.</td>
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<tr>
<td>5.</td>
<td>EBP IS useful in practice.</td>
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<td>6.</td>
<td>Teaching/classroom experience is more important than using EBP.</td>
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<td>7.</td>
<td>I would use EBP.</td>
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<td>8.</td>
<td>I would try EBP even if it were very different than what I am used to doing.</td>
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<td>9.</td>
<td>...it was intuitively appealing?</td>
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<td>10.</td>
<td>...it &quot;made sense&quot; to you?</td>
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<td>11.</td>
<td>...it was being encouraged by your school leadership?</td>
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<td>12.</td>
<td>...it was required by the district?</td>
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<tr>
<td>13.</td>
<td>...it was required by the state?</td>
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<td>14.</td>
<td>...it was being used by respected colleagues who were happy with it?</td>
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<td>15.</td>
<td>...you felt you had enough training to use it correctly?</td>
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<td>16.</td>
<td>I would adopt EBP if my students would benefit from it.</td>
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<td>17.</td>
<td>I would adopt EBP if I knew more about how my students liked it.</td>
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<tr>
<td>18.</td>
<td>I would adopt EBP if I knew it was right for my students.</td>
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<td>19.</td>
<td>I would adopt EBP if I had a say in which evidence-based practice was going to be used.</td>
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<tr>
<td>20.</td>
<td>I would adopt EBP if I had a say in how I would use it.</td>
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<tr>
<td>21.</td>
<td>I would adopt EBP if it fit with my professional approach.</td>
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<td>22.</td>
<td>I would adopt EBP if it fit with my philosophy as an educator.</td>
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<td>23.</td>
<td>I have enough time to learn anything new.</td>
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<td>24.</td>
<td>Implementing EBP prevents me from meeting my other obligations.</td>
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<td>25.</td>
<td>I know how to fit delivery of EBP into my current practices.</td>
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<td>26.</td>
<td>Implementing EBP will cause too much burden on me.</td>
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