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Early Elementary Trajectories of Classroom Behavior Self-Regulation: Prediction by Student Characteristics and Malleable Contextual Factors

Brittany N. Zakszeski
Lehigh University, brk213@lehigh.edu

Early Elementary Trajectories of Classroom Behavior Self-Regulation: Prediction by Student Characteristics and Malleable Contextual Factors

by

Brittany N. Zakszeski

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Date

_____

Robin L. Hojnoski, Ph.D.
Dissertation Chair
Associate Professor of School Psychology
Lehigh University

_____

Accepted Date

Committee Members:

_____

Bridget V. Dever, Ph.D.
Associate Professor of School Psychology
Lehigh University

_____

George J. DuPaul, Ph.D.
Professor of School Psychology
Lehigh University

_____

Megan M. McClelland, Ph.D.
Professor of Human Development and
Family Studies
Oregon State University

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Table of Contents

Acknowledgements iv
Table of Contents vi
List of Tables vii
List of Figures viii
Abstract 1
Chapter I: Introduction and Literature Review 2
Defining and Measuring Self-Regulation 4
Heterogeneity in Self-Regulation Development: Student-Level Factors 6
Self-Regulation Development in Context: Classroom-Level Factors 10
Self-Regulation Development in Context: School-Level Factors 14
The Current Study 16
Chapter II: Method 21
Dataset 21
Participants and Settings 21
Measures 23
Data Analysis Plan 27
Chapter III: Results 30
Differences Between Included and Excluded ECLS-K:2011 Participants 30
Descriptive Statistics and Correlations 31
Multilevel Effects on Self-Regulation Growth and Outcomes 32
Chapter IV: Discussion 38
Alternative Interpretations 39
Consideration of Potential Risk Factors and Malleable Factors 40
Limitations 48
Future Directions in Research and Practice 50
Conclusions 55
References 56
Curriculum Vitae 104

List of Tables

Table 1. *Overview of Model Variables* 79
Table 2. *Descriptive Statistics for Included and Excluded Participants on Model Variables* 82
Table 3. *Correlations and Descriptive Statistics for Outcome and Student-Level Variables* 84
Table 4. *Correlations and Descriptive Statistics for Outcome and Classroom-Level Variables* . 86
Table 5. *Correlations and Descriptive Statistics for Outcome and School-Level Variables*..... 87
Table 6. *Fully Unconditional Model for Self-Regulation* 88
Table 7. *Final Four-Level Model*..... 89

List of Figures

Figure 1. Multilevel model of child characteristics and kindergarten contextual factors on self-regulation growth and outcomes at first-grade Spring 91

Figure 2. Teacher-rated self-regulation as a function of time and child age (25th, 50th, and 75th percentiles) 92

Figure 3. Teacher-rated self-regulation as a function of time and child sex (0 = male, 1 = female) 93

Figure 4. Teacher-rated self-regulation as a function of time and child socioeconomic status (25th, 50th, and 75th percentiles) 94

Figure 5. Teacher-rated self-regulation as a function of time and kindergarten teacher-reported student-teacher closeness (25th, 50th, and 75th percentiles) 95

Figure 6. Teacher-rated self-regulation as a function of time and kindergarten teacher-reported student-teacher conflict (25th, 50th, and 75th percentiles) 96

Figure 7. Teacher-rated self-regulation as a function of time and kindergarten class size (25th, 50th, and 75th percentiles) 97

Figure 8. Teacher-rated self-regulation as a function of time and kindergarten teacher-reported class-level behavior (25th, 50th, and 75th percentiles) 98

Abstract

A critical component of school success as well as social competence, self-regulation develops rapidly across the early childhood years, and its development appears to be influenced by both child and contextual factors. The utility of early identification and intervention practices for supporting self-regulation development may be enhanced by a better understanding of what factors characterize children who are at risk for challenges and what contextual mechanisms propel children on desirable developmental trajectories. The current study leverages a large, nationally representative dataset and four-level, longitudinal analyses to evaluate an ecological model of classroom behavior self-regulation development that considers student-, dyadic-, classroom-, and school-level factors in relation to teacher-rated self-regulation growth and outcomes across the kindergarten and first-grade years. Analyses identified reliable associations for growth trajectories and the risk factors of being younger, male, and from a low-socioeconomic-status background; experiencing low student-teacher closeness and high student-teacher conflict; as well as attending a kindergarten class with fewer students and lower levels of peer-displayed appropriate behavior. Associations for malleable contextual factors with trajectories signify positive relationships with adults, skill development opportunities outside adults' external regulation of behavior, and peers' modeling of positive behavior as potential benefits to self-regulation development. Findings indicate the viability of multiple child and contextual factors as potential targets of early identification and intervention practices. In addition, findings point to the need for research focused on clarifying contextual contributions to self-regulation development, investigating intervention effects on self-regulation, examining the relatedness of distinct self-regulation constructs, and developing objective yet contextualized measures for assessing self-regulation.

Chapter I: Introduction and Literature Review

Adaptive development in the context of adversity, or resilience, is a common phenomenon that is largely dependent upon the capacity to regulate one's own cognitions, emotions, and behaviors (Masten, 2001, 2014). A resilience factor for lifelong development, self-regulation protects against mental health difficulties (e.g., Wyman et al., 2010), facilitates positive interpersonal interactions and relationships (e.g., Denham et al., 2003), and provides a foundation for academic learning (e.g., McClelland et al., 2007). Together, these functions make self-regulation a critical component of children's readiness for school (Blair, 2002; Blair & Raver, 2015; Calkins & Williford, 2009; Cameron Ponitz, McClelland, Matthews, & Morrison, 2009; McClelland & Cameron, 2012; Sulik, Blair, Mills-Koonce, Berry, Greenberg, & The Family Life Project Investigators, 2015; Zelazo, Blair, & Willoughby, 2016). Specifically, self-regulation enables successful adaptation to formal classroom environments during the transition to kindergarten (Neuenschwander, Rothlisberger, Cimeli, & Roebers, 2012) and supports academic achievement long after kindergarten, throughout formal schooling (Claessens, Duncan, & Engel, 2009; Duncan et al., 2007) and even into adulthood (McClelland, Acock, Piccinin, Rhea, & Stallings, 2013).

A substantive literature base provides evidence that self-regulation is highly malleable and responsive to intervention, such that it represents a powerful target for change with both educational and societal value (see Murray, Rosenbalm, Christopoulos, & Hamoudi, 2015). The connectedness of self-regulation to school functioning and performance, coupled with its malleability, justifies the adoption of practices that promote self-regulation development as a means of enhancing school readiness, supporting adjustment and achievement, and preventing school failure (Blair & Diamond, 2008; Raver, 2012; Shapiro, 2000; Ursache, Blair, & Raver,

2012; Zelazo et al., 2016).

As kindergarten classrooms continue to evolve in terms of daily activities and expectations, with greater emphases on teacher-directed instruction and academic content (Bassok, Latham, & Rorem, 2016), one's effectiveness in self-regulating classroom behaviors may be increasingly important to adaptive functioning and successful performance in academic, behavioral, and social-emotional realms. For example, children who entered kindergarten in 2010 exhibited more advanced literacy and mathematics skills, but not behavioral skills, relative to children entering kindergarten in 1998 (Bassok & Latham, 2017). In fact, relative to the children and teachers in the Early Childhood Longitudinal Study, Kindergarten (ECLS-K) cohort of 1998, children in the more recent kindergarten cohort were described by their teachers as demonstrating poorer behaviors indicative of self-regulation, such as in sustaining attention, working independently, persisting in completing tasks, and controlling emotions (Bassok & Latham, 2017). Aside from the possibility of truly lower levels of kindergarteners' self-regulation in this cohort as compared to the previous one, differences in teacher perceptions might be a function of a dissimilar classroom ecology (e.g., more instruction-focused, with more rigorous curricula), giving rise to more dysregulated behaviors. Alternatively, such differences might be attributable to teachers holding more stringent expectations for classroom behavior and academic performance in the latter cohort (Bassok et al., 2016). Regardless of the source of the difference, it is evident that kindergarteners' dysregulated behaviors have the potential to make classrooms unmanageable contexts with frequent distractions and disruptions. Further, peer-modeled dysregulated behavior and instructional time lost to distractions and disruptions may impede students' self-regulation development (Day, Connor, & McClelland, 2015).

There is evidence to suggest that development of classroom behavior self-regulation is

influenced by both child characteristics and aspects of the classroom environment (e.g., Bassok & Latham, 2017; Day et al., 2015; Fuhs, Farran, & Nesbitt, 2013), indicating the utility of ecologically informed early identification and intervention practices (Guare, 2014). The efficiency and effectiveness of such practices, however, are predicated on a comprehensive understanding of what factors characterize children who are at risk for challenges and what contextual factors facilitate children's desirable trajectories of development (Guare, 2014; Murray, Rosenbalm, & Christopoulos, 2016). Unfortunately, the extant related literature is comprised of studies that are limited in that they: (a) consider the contributions of student-, classroom-, and school-level factors in separate models; (b) examine self-regulation abilities cross-sectionally (as opposed to longitudinally); and/or (c) use considerably limited samples (i.e., in terms of size and/or representativeness) or statistical techniques (e.g., without accounting for the nesting of data). The current study seeks to address these gaps in the literature by using a large, nationally representative, longitudinal dataset and multilevel analyses to evaluate an ecological model of classroom behavior self-regulation development that includes student-, classroom-, and school-level factors in relation to self-regulation growth and outcomes across the kindergarten and first-grade years.

Defining and Measuring Self-Regulation

Herein, *self-regulation* will refer to the observable manifestation of integrated and autonomously controlled behavioral, attentional, and emotional processes that are task-oriented and/or goal-directed, that is, activated by an individual in response to, or motivated by, contextual demands (Blair & Raver, 2015; McClelland & Cameron, 2012). In recognition of various labels and definitions generated by multidisciplinary interest in related constructs, self-regulation may encompass both executive function and effortful control processes (Burman,

Green, & Shanker, 2015; Zhou, Chen, & Main, 2012). This study's definitional emphasis on *integrated* regulatory processes rather than distinct process components (e.g., attentional focusing, inhibitory control, working memory; Happaney, Zelazo, & Stuss, 2004) is founded on self-regulation being most appropriately represented as a single latent construct in early childhood, both in measurement (Wiebe, Espy, & Charak, 2008) and in practical enactment (McClelland & Cameron, 2012). Further, the definitional emphasis on *activated* and *motivated* self-regulation facilitates recognition of the importance of self-regulation development in terms of socially significant (e.g., educational) outcomes.

Self-regulation may be understood as either an ability (i.e., intraindividual capacity) or an event (i.e., behavioral occurrence) (Martin & McLellan, 2008) (cf. Winne & Perry, 2000). In fact, assessment methods, which have commonly constituted performance-based and rating-scale approaches (Fuhs, Farran, & Nesbitt, 2015; McClelland & Cameron, 2012), are thought to measure two distinct self-regulation constructs that align with these dissimilar conceptualizations (Stichter, Christ, Herzog, O'Donnell, & O'Connor, 2016; Toplak, West, & Stanovich, 2013). Specifically, direct assessments appear to more precisely evaluate one's cognitive capacity to self-regulate and the efficiency of this capacity, whereas behavior rating scales (e.g., completed by parents or teachers) better capture one's success in applying this self-regulation capacity in pursuing goals or meeting contextual demands (Toplak et al., 2013). That is, self-regulation may be understood and measured in terms of (a) capacity and efficiency (i.e., within Stanovich's [2009, 2011] algorithmic level of cognition) or (b) application and effectiveness (i.e., within Stanovich's [2009, 2011] reflective level of cognition).

As Fuhs and colleagues (2015) have conveyed, adopting a multi-method approach to measuring self-regulation via both direct assessment and informant ratings could provide the

most comprehensive picture of children's self-regulation. There is evidence to suggest, however, that these constructs are so distinct as to correlate only moderately when concurrently assessed (Stichter et al., 2016; Toplak et al., 2013). Thus, research examining self-regulation trajectories is likely best-advised to model development individually for these self-regulation constructs.

In a step toward expounding mechanisms of development, the current paper focuses upon the outcome of self-regulation as a dimension of social competence, specifically, in children's self-regulation of their classroom behavior as rated by their teachers. Thus, the sections that follow review empirical literature focusing on self-regulation measured via informant report (hereafter simply referred to as "self-regulation"), unless otherwise specified. Despite the indirect nature of measurement, informant-rated self-regulation has been consistently linked, both concurrently and longitudinally, to socially significant outcomes such as children's academic achievement (e.g., Fuhs et al., 2015; McClelland, Acock, & Morrison, 2006; McClelland, Morrison, & Holmes, 2000; Schmitt, Pratt, & McClelland, 2014) and multiple domains of adults' functioning and livelihood (e.g., Moffitt et al., 2011). It is thought that this construct, relative to its directly assessed counterpart, is more reflective of multiple facets of children's functioning in school (i.e., in academic, behavioral, emotional, and social domains), such that it represents a more socially and ecologically valid target in school settings for the purposes of both identification and intervention. Further, it is thought that the development and enactment of this construct, relative to those of its counterpart, occur largely through processes that are more dependent upon contextual factors in addition to child characteristics.

Heterogeneity in Self-Regulation Development: Student-Level Factors

A broad literature base provides evidence of self-regulation growing across the early childhood years, with directly assessed self-regulation revealing rapid development (e.g.,

Diamond, 2002) and informant ratings of self-regulation demonstrating greater temporal stability (e.g., McClelland & Morrison, 2003). Research with these existing measurement methods has described development as occurring most rapidly in the pre-kindergarten period prior to the start of formal schooling, with growth generally tapering off by middle childhood (McClelland & Cameron, 2012). Although general consistencies in self-regulation development have been documented, there are also considerable differences in development among children in terms of the emergence of self-regulation and the rate of their development (e.g., Welsh, Miller, Kooken, Chafouleas, & McCoach, 2016). Heterogeneity in development has been found to be explained, to some extent, by demographic factors such as child sex and household socioeconomic status (SES).

Demographic factors. With regards to sex, most research has identified a female advantage in terms of early childhood self-regulation development, with girls demonstrating higher levels of self-regulation earlier in development compared to boys (e.g., Matthews, Ponitz, & Morrison, 2009; Owens, 2016; Welsh et al., 2016; Williford, Vick Whittaker, Vitiello, & Downer, 2013). Additionally, young children's SES—which is commonly considered to include factors such as household income, parental educational attainment, and parental occupational prestige (e.g., Tourangeau et al., 2015)—has been found to be reliably associated with self-regulation outcomes (e.g., Pratt, McClelland, Swanson, & Lipscomb, 2016; Sektnan, McClelland, Acock, & Morrison, 2010). Specifically, children from lower SES backgrounds often exhibit delays in developing self-regulation, perhaps as a function of home environments offering fewer developmental learning resources and scaffolds.

It should be clarified, however, that it is typically the accumulation of risk factors rather than the presence of one risk factor in isolation that predisposes children to the most challenging

of developmental courses (Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Cadima et al., 2016; Pratt et al., 2016). Further, risk factors often include environmental characteristics in addition to child characteristics. Self-regulation development across early childhood is thought to be the product of integrated developmental, psychological, and biological processes shaped by children's ecological contexts (Blair & Raver, 2015). Specifically, as Bronfenbrenner (1994) has described, this development occurs "through processes of progressively more complex reciprocal interactions between an active, evolving biopsychological human organism"—the child— "and the persons, objects, and symbols in its immediate environment" (p. 38). These proximal processes have profound influences on young children's development, such that Bronfenbrenner and Morris (2006) refer to these interactions as "the engines of development."

Accordingly, in exploring heterogeneity in self-regulation developmental trajectories, this paper adopts both (a) a systems-ecological perspective (e.g., Bronfenbrenner, 1994; Bronfenbrenner & Morris, 2006) in acknowledging the importance of contexts for development, as well as (b) a proactive, preventative orientation in addressing emerging child difficulties early in development by leveraging schools' provision of access to young children at kindergarten entry (e.g., Hojnoski & Missall, 2006). In alignment with this systems-ecological perspective and preventative orientation, proximal processes and systems are viewed as viable and significant agents of change for promoting positive developmental and educational outcomes.

Dyadic student-teacher relationships. One type of proximal process that has been linked with self-regulation development is children's interactions with their teachers and the corresponding student-teacher relationships that are formed (Mashburn et al., 2008). Educators' provision of effective emotional supports and organizational supports has been shown to facilitate young children's development of self-regulation (e.g., Bailey, Denham, Curby, &

Bassett, 2016; Jennings & Greenberg, 2009). Emotional supports include warm, respectful, responsive, and sensitive interactions that foster children's secure attachments with, positive perceptions of, and closeness with their teachers. Organizational, or instructional, supports refer to teachers' use of behavior management practices and developmentally appropriate, engaging instructional activities that are intended to promote positive behavior and reduce conflict (Hamre & Pianta, 2005).

Teachers' strategic use of emotional and organizational supports is linked with more positive student-teacher relationships and greater developmental gains, and more positive relationships with teachers marked by high closeness and low conflict are associated with a range of behavioral indicators of self-regulation (e.g., classroom adjustment, engagement, positive work habits, prosocial behavior) (Baker, Grant, & Morlock, 2008; Decker, Dona, & Christenson, 2007; Gallagher, Kainz, Vernon-Feagans, & White, 2013; Graziano, Garb, Ros, Hart, & Garcia, 2016; Wu, Hughes, & Kwok, 2010). In contrast, emotionally unsupportive classrooms that are negative, controlling, and teacher-centered typically offer few opportunities for children to practice their social skills due to overreliance on external regulation by teachers. Similarly, laissez-faire classrooms with limited organizational supports often fail to optimally promote children's social skills by providing too few or otherwise limited scaffolds (Kienbaum, 2001).

Fortunately, research has found student-teacher interactions and relationships to be amenable to intervention (Raver et al., 2008). Thus, classrooms providing limited emotional and organizational supports may benefit from interventions that target the student-teacher relationship dynamic. Limited research, however, has examined associations between student-teacher relationship and the specific social skill of self-regulation. In one study (Gaias, Abry, Swanson, & Fabes, 2016), teachers reported experiencing the least close and most conflicted

relationships with their kindergarten students who demonstrated the lowest self-regulation; replication, however, is needed with a larger and more diverse sample.

Beyond the influence of dyadic interactions, it is also important to account for contextual systems and malleable factors at the levels of the classroom and school.

Self-Regulation Development in Context: Classroom-Level Factors

Classroom organizational factors such as the kindergarten schedule, class size, and class-level behavior have been linked with differences in children's classroom behavior, suggesting they may be implicated in the development of classroom behavior self-regulation.

Kindergarten schedule. In the United States' public education system, the duration of the kindergarten day varies widely between and, in some cases, within states. In 2016, 13 states and the District of Columbia required children's attendance of full-day kindergarten (FDK), whereas the remaining 37 states did not require FDK (Parker, Diffey, & Atchison, 2016). Discrepancies in educational mandates at the state and local levels result in children receiving varying dosages of kindergarten that might be anywhere from less than 3 to nearly 8 hr of participation in kindergarten classrooms per day. Such scheduling variability has been found to relate to differential trajectories of academic achievement, with children in FDK classrooms demonstrating greater academic gains relative to their peers in half-day kindergarten (HDK) classrooms (e.g., Cooper, Allen, Patall, & Dent, 2010), though these gains are generally evaluated as being short-lived (e.g., diminishing by the end of first grade) (DeCicca, 2007; Reynolds & Temple, 2009; Wolgemuth, Cobb, Winokur, Leech, & Ellerby, 2006; Zvoch, 2009). The promise of improved academic outcomes, however, has led some (e.g., Community Preventive Services Task Force, 2014; Hahn et al., 2014) to call for FDK to be made available, at the minimum, to all children at-risk for school failure based on family demographics (e.g., low

SES).

A significantly smaller literature base has examined social-behavioral outcomes according to kindergarten scheduling, and findings are mixed. Some studies point to a FDK advantage for behavioral indicators of self-regulation such as increased compliance with following directions (Baskett, Bryant, White, & Rhoads, 2006), fewer externalizing problem behaviors (Cannon, Jacknowitz, & Painter, 2006), and more appropriate involvement in classroom activities (Cryan, Sheehan, Wiechel, & Bandy-Hedden, 1992). Others suggest that such benefits are not as evident. For example, Finn and Pannozzo (2004) observed significantly more favorable ratings of class-level behavior for HDK relative to FDK classrooms but no significant differences in the behavior ratings of individual students in these classrooms.

Altogether, the impacts of FDK and HDK on young children's behavioral development remain unclear, and no published research has specifically considered relations of kindergarten scheduling and self-regulation development. Scheduling may exert its own effect on self-regulation by determining children's duration of exposure to potential developmental supports or taxing demands, but it could also be that children's self-regulation development varies as a function of other classroom-level factors, such as the number of students in a class (see Zvoch, Reynolds, & Parker, 2008).

Class size. Class size has been a popular focus of educational reform movements, with advocates suggesting that children make greater academic progress when they are in smaller classes (Ehrenberg, Brewer, Gamoran, & Willms, 2001). Research syntheses have generally concluded that adequately funded class-size reduction efforts in the early elementary years generate substantial academic achievement gains for children irrespective of risk factors but increasingly so for children from low-SES backgrounds, with these gains being greater the

longer children attend small classes (e.g., Biddle & Berliner, 2002; Whitehurst & Chingos, 2011). Much like kindergarten schedule evaluations, most class size evaluation efforts have focused on academic and not behavioral outcomes, such that the effects of class size on classroom behavior are less clear.

It has been postulated that smaller classes (a) better facilitate high-quality student-teacher interactions and (b) give rise to lower levels of student misbehavior and teacher stress (Biddle & Berliner, 2002), thereby supporting students' meaningful classroom engagement (Finn, Pannozzo, & Achilles, 2003). Indeed, there is evidence to support that young children and early elementary students in smaller classes engage in more interactions with teachers (Blatchford, 2003, 2005; Blatchford, Bassett, & Brown, 2011), receive more individualized and higher-quality emotional and organizational supports (Blatchford, 2005; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 2004), benefit from greater closeness with teachers (NICHD ECCRN, 2004; Skalicka, Belsky, Stenseng, & Wichstrom, 2015), and exhibit lower levels of dysregulated classroom behaviors (Blatchford, 2005; Blatchford et al., 2011; Finn & Pannozzo, 2004; NICHD ECCRN, 2004). There is also, however, evidence of no significant differences and effects in the opposite direction for small and large classes on each of these outcomes (e.g., Neal, Capella, Wagner, & Atkins, 2011; NICHD ECCRN, 2002; Rusby, Taylor, & Foster, 2007), with considerable variability in findings likely the product of a range of study samples and designs.

It seems important, however, to move beyond simply considering the *size* of the class to also account for the *composition* of the class—namely, the extent to which students within a class exhibit high levels of self-regulated or -dysregulated behavior (Biddle & Berliner, 2002; Englehart, 2006, 2011). Examination of class-level behavior is particularly important in the

context of the profound influences of peers on behavioral development.

Class-level behavior. Given evidence linking children's directly assessed self-regulation to that of their peers (Montroy, Bowles, & Skibbe, 2016), children's informant-rated self-regulation may also be affected by their peers' levels of self-regulation. Regarding the mechanism(s) of such influences, some (Bateson, 2005; Berlyne, 1960; Coplan & Arbeau, 2009; Peterson & Flanders, 2005) have proposed the importance of peer interactions in providing children with opportunities to observe peer models who demonstrate self-regulated behaviors as well as to practice using their own self-regulation skills outside of external regulation by adults. Kindergarten classrooms host both structured and unstructured peer interactions within instructional activities (Bassok et al., 2016); within these interactions, students access peer-modeled self-regulation and practice opportunities. Interacting with a high self-regulating classmate may be more beneficial to self-regulation development relative to interacting with one who frequently exhibits dysregulated behaviors. In fact, peers' dysregulated behavior may result in an overall experience of increased social stress and distress (see van Lier & Deater-Deckard, 2016), and the regulation of this stress may deplete cognitive resources available for other effortful self-regulatory processes (Baumeister, Twenge, & Nuss, 2002; Davies, Woitach, Winter, & Cummings, 2008).

In sum, opportunities for peer interactions, particularly with peers who are effective self-regulators, may meaningfully contribute to development, whereas exposure to peers' dysregulation may impair self-regulation enactment by monopolizing cognitive resources. In addition to the influence of peer behaviors on children's self-regulation of classroom behavior, teachers' and other school personnel's approaches to supporting self-regulation and addressing dysregulated behaviors may be important factors. These approaches, in turn, may be widely

influenced by school-level systems and supports.

Self-Regulation Development in Context: School-Level Factors

At the level of the school, factors such as (a) implementation of a school-wide positive behavior interventions and supports (SWPBIS) model and (b) teachers' access to behavioral support services may further foster children's development and enactment of classroom behavior self-regulation by providing additional or enhancing existing organizational supports for students' engagement in appropriate, self-regulated behaviors.

School-wide positive behavior interventions and supports (SWPBIS). Positive behavior support is an approach that includes "an ongoing process of research-based assessment, intervention, and data-based decision making focused on building social and other functional competencies, creating supportive contexts, and preventing the occurrence of problem behaviors" (Kincaid et al., 2016, p. 71). When applied school-wide as a systems framework, positive behavior support is implemented across a multi-tiered system that involves the provision of evidence-based supports at an intensity that matches student needs (Sugai & Horner, 2006). SWPBIS programming has been evaluated as reducing disciplinary actions (Bradshaw, Mitchell, & Leaf, 2010; McCurdy, Manella, & Eldridge, 2003; Scott & Barrett, 2004; Simonsen et al., 2012) as well as promoting positive behaviors (e.g., Sherrod, Getch, & Ziomeck-Daigle, 2009) and improving school climate (e.g., Bradshaw, Koth, Thornton, & Leaf, 2009; Horner et al., 2009; Pas, Waasdorp, & Bradshaw, 2015).

SWPBIS program evaluations most commonly rely upon outcome data that are readily collected and available in schools, hence the common reporting of disciplinary outcomes and survey data (Brandt, Chitiyo, & May, 2014). Accordingly, it appears that no published research to date has directly explored whether SWPBIS programming has positive effects on children's

development of self-regulation. It could be that evidence-based supports offered through SWPBIS assist children in both developing and enacting self-regulation of their behavior, such as through repeatedly reminding students of expectations for self-regulated behavior and consistently reinforcing children for appropriately self-regulating their behavior. Alternatively, it could be that SWPBIS programs solely offer teachers and other school-based practitioners guidance in effectively externally regulating their students' behaviors, such that SWPBIS programs do not directly support children's development and enactment of classroom behavior self-regulation. To explore this, it is necessary to examine measures of children's self-regulation across schools that do and do not implement SWPBIS.

Access to behavioral support services. Across school settings and regardless of SWPBIS implementation, school- or district-level professionals providing behavioral support services (e.g., school psychologists, school counselors, school social workers, behavioral specialists) may play important roles in supporting students' development of classroom behavior self-regulation. These roles may involve both direct and indirect service delivery. For example, through direct services, behavioral support staff might work with students in individualized or group interventions, such as in counseling, self-management interventions, and social skills instruction groups. Through indirect services, behavioral support staff might consult with teachers and paraprofessionals to make instructional and intervention recommendations.

The effectiveness of teacher-delivered behavioral supports may be influenced by external consultation and implementation assistance, particularly in the context of restricted pre- and in-service teacher training in behavioral management and interventions (National Center on Teaching Quality, 2014) and practical challenges in implementing evidence-based behavioral strategies with fidelity in classroom settings (Briesch, Briesch, & Chafouleas, 2015). There is a

substantial knowledge gap between general and special educators regarding classroom behavior management, a gap that might be best addressed through ongoing professional development and coaching opportunities (Beam & Mueller, 2017). When these opportunities are made available to teachers through access to behavioral support services, teachers may be better equipped to address their students' behavioral needs and thereby more effectually foster development of classroom behavior self-regulation.

The Current Study

As a critical and malleable (Murray et al., 2015) component of school readiness and success (Shapiro, 2000), self-regulation is a powerful target for change with far-reaching effects (Masten, 2001, 2014). To most effectively identify and implement practices to promote self-regulation development, it is imperative to understand heterogeneity in development, including contributions of contextual factors (Guare, 2014). In addition to children's age, sex, and SES, which have well-documented connections to self-regulation outcomes, factors at the levels of student-teacher dyads (i.e., relational closeness and conflict), classrooms (i.e., kindergarten schedule, class size, and class-level behavior), and schools (i.e., SWPBIS implementation and access to behavioral support staff) may explain differences in developmental trajectories of classroom behavior self-regulation. Overall, however, these contextual factors have been linked with self-regulation development only conceptually or in very limited ways empirically. To advance the knowledge base regarding self-regulation development and potentially inform the efficiency and effectiveness of school-based prevention and intervention efforts, an ecological model of classroom behavior self-regulation development is needed that accounts for viable contextual targets at the levels of proximal and systems processes within educational settings.

This study employs multilevel modeling with a large, nationally representative,

longitudinal dataset (i.e., the Early Childhood Longitudinal Study, Kindergarten Cohort of 2011; ECLS-K:2011) to describe teacher-reported classroom behavior self-regulation development in the first two years of elementary school and identify risk factors and malleable contextual factors associated with this development. Analyses were used to evaluate a model that accounts for longitudinal, student-, classroom-, and school-level predictors of developmental trajectories and outcomes across kindergarten and first grade (see Figure 1). In these analyses, the intercept was set at the end of the period, in the Spring of first grade, to evaluate contributions of student and contextual factors to self-regulation outcomes following a period of exposure to these contextual factors (e.g., it would not be meaningful to evaluate a relationship between children's kindergarten schedule and their self-regulation at kindergarten entry).

Focus was placed on *malleable* contextual factors given that such factors may be manipulated within individualized or systems-level interventions aimed at promoting self-regulation, or, more generally, social competence. Broadly, it was hypothesized that (a) being younger, male, and from a low-SES background at kindergarten entry corresponds with greater risk for less growth in self-regulation and lower outcomes at first-grade Spring; and that (b) experiencing higher dyadic closeness and lower dyadic conflict with kindergarten teachers, attending FDK classrooms with fewer students and lower levels of dysregulated behavior, and attending schools that offer SWPBIS programming and access to behavioral support staff are protective factors fostering greater self-regulation growth and greater outcomes at the end of first grade. Specifically, the following research questions and hypotheses were examined:

Research Question 1: Across three time points in kindergarten and first grade (i.e., kindergarten Fall, kindergarten Spring, first-grade Spring), what is the overall growth trajectory of classroom behavior self-regulation (i.e., do trajectories represent skill growth)?

A substantial body of literature (e.g., Diamond et al., 2002) describes self-regulation as growing during the early childhood years and, specifically, the transition to elementary school. Accordingly, it was expected that the tested growth term would be statistically significant, with the most rapid gains occurring across the kindergarten year and gains tapering off across the first-grade year.

Research Question 2: To what extent is variability in self-regulation found at the levels of the student, classroom, and school?

In recognition of the influences of inter-individual and contextual factors in relation to self-regulation development (e.g., Williford et al., 2013), it was expected that statistically significant percentages of variance in self-regulation would be found at the levels of the student, classroom, and school. Specifically, in alignment with Bronfenbrenner's (1994; Bronfenbrenner & Morris, 2006) conceptualization of proximal and distal factors in relation to development, it was hypothesized that the highest percentage of variance unexplained by time would be found at the level of the student (e.g., 65 – 75%), followed by the level of the classroom (e.g., 15 – 25%) and the level of the school (e.g., 5 – 15%).

Research Question 3: At the level of the student, are there differences in kindergarten-through-first-grade self-regulation growth and outcomes at first-grade Spring: (a) for students of varying characteristics (i.e., age, sex); (b) for students from various SES backgrounds; and (c) according to the levels of closeness and conflict, respectively, in individual students' relationships with their kindergarten teacher?

Given prior research that has identified different trajectories and/or outcomes of self-regulation according to age (e.g., Williford et al., 2013), sex (e.g., Matthews et al., 2009), SES (e.g., Pratt et al., 2016), and student-teacher relationship quality (e.g., Gaias et al., 2016), it was

hypothesized that each of these variables would uniquely predict variance in self-regulation growth across kindergarten and first grade and in outcomes at first-grade Spring. Specifically, it was expected that greater growth and outcomes would be found for children who were older, female, and from higher SES backgrounds and who had closer and less conflicted relationships with their kindergarten teacher, relative to their counterparts.

Research Question 4: At the level of the classroom, are there differences in kindergarten-through-first-grade self-regulation growth and outcomes at first-grade Spring according to (a) kindergarten schedule (i.e., FDK versus HDK), (b) kindergarten class size, and (c) kindergarten class-level behavior?

Prior research findings have informed the current hypotheses that students would have greater self-regulation growth and outcomes when they were enrolled in FDK (Cannon et al., 2006), when they attended smaller kindergarten classes (NICHD ECCRN, 2004), and when they attended kindergarten classes with higher levels of appropriate classmate behavior (Finn & Pannozzo, 2004; Montroy, Bowles, & Skibbe, 2016).

Research Question 5: At the level of the school, are there differences in kindergarten-through-first-grade self-regulation growth and outcomes at first-grade Spring according to (a) implementation of SWPBIS and (b) access to school personnel providing behavioral support services?

Although a large literature base provides evidence of SWPBIS outcomes being dependent upon the extent to which programming is implemented as intended and with high quality (e.g., Childs, Kincaid, & George, 2010; Childs, Kincaid, George, & Gage, 2016), it was expected that mere implementation of SWPBIS (i.e., whether administrators report such programming being implemented in their schools) would significantly predict self-regulation growth and outcomes,

such that greater self-regulation growth and outcomes would be found for schools that implemented SWPBIS relative to those that do not. Similarly, in the context of many elementary-level general educators reporting a desire for additional support in implementing evidence-based practices for supporting appropriate classroom behaviors (Briesch et al., 2015), it was hypothesized that access to school personnel offering behavioral support services would significantly predict self-regulation growth and outcomes, such that greater self-regulation growth and outcomes would be found for schools with access to behavioral support personnel relative to those without such access.

Chapter II: Method

Dataset

This study examined data collected by the National Center for Education Statistics (NCES) through its ECLS-K:2011 program. This dataset is highly valuable for answering the proposed research questions given its large, nationally representative sample; its longitudinal design; and its measurement of a range of child and contextual variables measured via detailed parent, teacher, and administrator questionnaires and interviews (Tourangeau et al., 2015).

Participating children and schools for the ECLS-K:2011 were identified through a three-stage stratified sampling method within geographic regions, within varying types and sizes of public and private schools, and of students of varying racial/ethnic and socioeconomic backgrounds. This sampling process resulted in a nationally representative sample of approximately 18,150 children beginning kindergarten in about 1,350 (1,050 public, 300 private) diverse schools (all sample sizes reported herein are rounded to the nearest 10 in accordance with IES restricted-use reporting guidelines).

Participants and Settings

This study examines self-regulation trajectories for a subsample of 8,220 children in the 2010–2011 cohort across three time points in their kindergarten and first-grade years (i.e., kindergarten Fall, kindergarten Spring, first-grade Spring; outcome data were not collected at first-grade Fall). Children were selected from the larger ECLS-K:2011 sample if they (a) had outcome data on each of the three measurement occasions as well as complete data on specific student-, classroom-, and school-level variables of interest; and (b) remained in the same classroom for their kindergarten year and school for their kindergarten and first-grade years. The relevance of these inclusion criteria to the current study is delineated below.

Approximately 7,450 children, or 41.05% of the ECKLS-K:2011 sample, were missing outcome data on one or more measurement occasions (including 1,910 children who joined the ECLS-K:2011 during the Spring of their kindergarten year; i.e., data missing by design), which is problematic given a minimum of three measurement occasions is required to model growth (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011). Although multiple imputation is considered to be a less biased or, at minimum, equivalent approach to handling missing data relative to listwise deletion (Acock, 2012), the recommended approach to handling missingness on outcome variables is von Hippel's (2007) multiple imputation then deletion (MID) method (Acock, 2012). This approach calls for (1) imputing outcome variables for the sake of informing imputation on other variables but then (2) deleting these imputed outcome values when running analyses (as "the imputed *Y*s will add nothing other than noise due to the uncertainty of estimated values," Acock, 2012, p. 37). Accordingly, adopting MID would not overcome the issue of missing measurement occasions, such that children with such missingness could not be included in longitudinal analyses and are excluded in the current study.

Further, in some cases, data were missing at the level of the student, classroom, or school, and multilevel modeling analyses delete cases missing data listwise at upper levels of analyses (Raudenbush et al., 2011). Given a lack of consensus regarding imputation methods for upper-level predictor variables within hierarchical structures (e.g., van Buuren, 2011), children with missing data on these variables (n = 2,060) were also excluded from analyses.

Finally, due to the likelihood of nuances in trajectories related to mobility and, thereby, changes in context and demands for adjustment (e.g., Gruman, Harachi, Abbott, Catalano, & Fleming, 2008), the current sample also excludes 420 child participants who changed schools at any point during the 2-year period or changed teachers mid-year during the 2-year period.

Hence, the sample analyzed for the current study includes approximately 8,220 children, a sample size that was expected to provide sufficient power for completing the proposed analyses. Preliminary analyses were used to compare included and excluded child participants on all model variables to identify and describe any differences between these samples (see Results, "Differences Between Included and Excluded ECLS-K:2011 Participants").

Child participants (50.7% male) ranged in age from 49 to 85 months (M = 67.79, SD = 4.37) at the kindergarten Fall assessment date (i.e., between September and December of their kindergarten year) (Tourangeau et al., 2015). Parents reported 54.6% of children as White, non-Hispanic; 21.2% as Hispanic, race specified; 11.1% as Black/African American, non-Hispanic; 6.6% as Asian, non-Hispanic; 4.7% as two or more races, non-Hispanic; and less than 1% as Hispanic (no race specified), Native Hawaiian/Pacific Islander, or American Indian/Alaskan Native, respectively. In the Fall of their kindergarten year, child participants attended 2,330 classrooms (M = 4 child participants per classroom, SD = 2.57, range: 1 to 20) in 740 schools (M = 11 child participants per school, SD = 4.79, range: 1 to 23) (88.5% of children attended public schools) across the United States.

Measures

This study analyzed data reported on questionnaires and in interviews by parents, general education classroom teachers, and school administrators during the 2010–2011 and 2011–2012 academic years as specified below. For detailed accounts of recruitment methods, data collection procedures, and data imputation methods, refer to the ECLS-K:2011 user's manual (Tourangeau et al., 2015).

Outcome: Classroom behavior self-regulation. Teachers completed a 12-item short form of the Children's Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006) for each child

participant in their classrooms during the Fall of 2010, Spring of 2011, and Spring of 2012 data collection waves. The CBQ asks teachers to read statements about how children might have reacted to classroom situations in the past 6 months and rate the truthfulness of these statements on a 7-point, Likert-type scale (ranging from *extremely untrue* to *extremely true*). This short form of the CBQ divides items onto two 6-item scales, Attentional Focusing and Inhibitory Control. Internal consistency estimates for the broader ECLS-K:2011 sample were .87 for each scale (Tourangeau et al., 2015). Although item-level data are not available to directly assess factor structure, prior studies have found these two scales to load on the same factor, Effortful Control (Putnam & Rothbart, 2006; Rothbart, Ahadi, Hershey, & Fisher, 2001), and subscale scores were found to be highly correlated in the current dataset (at kindergarten Fall, $r = .793$, $p < .001$; at kindergarten Spring, $r = .788$, $p < .001$; at first-grade Spring, $r = .767$, $p < .001$). Given that self-regulation is best understood as an integrative capacity and single construct in early childhood (McClelland & Cameron, 2012; Wiebe et al., 2008), Attentional Focusing and Inhibitory Control scores at each period are summed to create the composite variable of classroom behavior self-regulation, consistent with the use of Effortful Control composites in prior studies (e.g., Eisenberg et al., 2013; Spinrad et al., 2012; Valiente et al., 2011).

Student-level variables. Five student-level predictors (i.e., age, sex, SES, student-teacher closeness, and student-teacher conflict) were examined in relation to self-regulation growth and outcomes.

Age and sex. Parents reported children's date of birth and sex via demographic questionnaires during the Fall of 2010. NCES statisticians used dates of birth to compute child age, in months, at the first day of assessment within each data collection phase. Age at Fall 2010 data collection and sex (male, female) were used as predictors in the current study.

SES. In interviews with ECLS-K:2011 data collectors across the kindergarten year, parents provided information regarding their educational attainment (Fall 2010), occupational prestige (Fall 2010), and household income (Spring 2011). Continuous, mean-centered household SES composites were computed by NCES statisticians using the following five components: (1) educational attainment of first parent, (2) educational attainment of second parent, (3) occupational prestige score of first parent, (4) occupational prestige score of second parent, and (5) household income. Data were missing for 2.0% of child participants on Component 1, 3.0% on Component 2, 1.9% on Component 3, 3.1% on Component 4, and 15.3% on Component 5 due to some parents not completing each phase of the interviews. In these cases, NCES statisticians imputed data separately for each component using the hot-deck method, through which respondents with similar characteristics to nonrespondents "donate" values to these nonrespondents (Little & Rubin, 2002).

Student-teacher relationship quality: Closeness and conflict. In Spring of 2011, teachers completed the Student-Teacher Relationship Scale (STRS; Pianta, 2001; Pianta & Steinberg, 1992) individually for each child participant. The STRS is a 15-item questionnaire that presents statements about student-teacher relationships and asks teachers to respond on a 5-point, Likert-type scale regarding the relevance of each statement to their relationship with the specified student (*definitely does not apply* to *definitely applies*). The STRS is comprised of a 7-item Closeness scale and 8-item Conflict scale. High Closeness scores indicate perceptions of high relational closeness (e.g., affection, warmth, and open communication with the student), whereas high Conflict scores indicate perceptions of high relational conflict (e.g., negativity and disagreements with the student). The current study analyzed the mean score (i.e., sum of scale items divided by the number of items) for each scale (Tourangeau et al., 2015). Scale scores

have been shown to correlate with direct observations of classroom interactions (e.g., Downer, Booren, Lima, Luckner, & Pianta, 2010) and to predict teachers' ratings of young children's classroom behavior and academic performance (e.g., Hamre & Pianta, 2001). Internal consistency estimates for the broader ECLS-K:2011 sample were .89 for each scale (Tourangeau et al., 2015).

Classroom-level variables. The following three classroom variables were reported by teachers on questionnaires in the Fall of 2010.

Kindergarten schedule. Teachers recorded whether the child participant attended HDK or FDK, as well as whether HDK students attended morning or afternoon classes. Time of day for HDK students is not considered in the current study to allow the focus to remain on the duration of kindergarten attendance rather than its timing.

Class size. Teachers provided the total number of children enrolled in their class at the time of data collection.

Class-level behavior. Teachers rated the overall behavior of children in their class on a 5-point, Likert-type scale, ranging from *group misbehaves very frequently and is almost always difficult to handle* to *group behaves exceptionally well*.

School-level variables. The following school-level variables were reported by administrators or teachers on questionnaires across the two years of data collection.

Implementation of SWPBIS. In the Fall of 2011, administrators reported whether their school was implementing a SWPBIS program (*yes*, *no*).

Access to behavioral support staff. In the Spring of 2012, teachers reported their level of contact with "a school or district staff member whose role is to provide ongoing training and support to classroom teachers in the delivery of effective behavioral supports." Specifically,

teachers endorsed one of the following three responses: (1) *yes, support received*; (2) *no, support not received but available*; or (3) *resource not available*. To allow the variable "access to behavioral support staff" to be included in analyses, these original variables were computed to this new variable by combining responses 1 and 2 (i.e., access available) to be tested alongside response 3 (i.e., access not available).

Data Analysis Plan

In addition to descriptive and correlational analyses run in SPSS 24.0 (IBM Corp., 2016), a four-level, longitudinal, hierarchical linear model (i.e., occasions within students within classrooms within schools) with a varying slope and varying end-point intercept (i.e., at first grade Spring; X1 = –17, X2 = –12, X4 = 0) was used to model development using HLM 7.0 software (Raudenbush et al., 2011). As the only available estimation method for four-level models, full information maximum likelihood was used to estimate parameters (Raudenbush et al., 2011). Analyses were conducted stepwise in a bottom-up approach to individually test the hypothesized predictors, such that hypothesized effects found to be not statistically significant were removed from subsequent analyses. Hypothesized predictors were tested in the order specified within the research questions and model equations below until variance components were no longer significant at each level (i.e., there is no longer significant variability unexplained by the model at each level) or the model failed to converge. Although the number of occasions available in the current dataset (due to changes in measurement beyond first grade) precluded the examination of quadratic growth, this study offers a pilot analysis of linear growth to inform continued research efforts.

Listed and defined below are equations for each level within the multilevel model. See Table 1 for descriptions of the outcome, occasion, predictor, and covariate variables specified.

Level 1 can be understood as the between-occasion (within-student, within-classroom, within-school) model. The outcome of self-regulation ($SELFREG_{tijk}$) at occasion *t* for student *i* in classroom *j* in school *k* was specified as:

$$SELFREG_{tijk} = \pi_{0ijk} + \pi_{1ijk}(TIMEX4_{tijk}) + e_{tijk}$$

where π_{0ijk} is the level-1 intercept; π_{1ijk} is the level-1 slope; $TIMEX4_{tijk}$ is the occasion, centered around the final measurement (i.e., first grade Spring); and e_{tijk} is the level-1 random effect. Each level-1 coefficient became an outcome variable in the level-2 model.

Level 2, which can be understood as the between-student (within-classroom, within-school) model, was specified as:

$$\pi_{0ijk} = \beta_{00jk} + \beta_{01}(X1KAGE\_R_{ijk}) + \beta_{02}(X\_FEMALE_{ijk}) + \beta_{03}(X12SESL_{ijk}) + \beta_{04}(X2CLSNSS_{ijk}) + \beta_{05}(X2CNFLCT_{ijk}) + r_{0ijk}$$

$$\pi_{1ijk} = \beta_{10jk} + \beta_{11}(X1KAGE\_R_{ijk}) + \beta_{12}(X\_FEMALE_{ijk}) + \beta_{13}(X12SESL_{ijk}) + \beta_{14}(X12CLSNSS_{ijk}) + \beta_{15}(X2CNFLCT_{ijk}) + r_{1ijk}$$

where β_p are level-2 coefficients, r_{0ijk} is the level-2 random effect for intercept, and r_{1ijk} is the level-2 random effect for slope. Each level-2 coefficient became an outcome variable in the level-3 model.

Level 3, which can be understood as the between-classroom (within-school) model, was specified as:

$$\beta_{00jk} = \gamma_{000k} + \gamma_{001}(FDK_{jk}) + \gamma_{002}(CLASSSIZE_{jk}) + \gamma_{003}(CLASSBEHVR_{jk}) + \mu_{00jk}$$

$$\beta_{01jk} = \gamma_{010k}$$

. . .

$$\beta_{05jk} = \gamma_{050k}$$

$$\beta_{10jk} = \gamma_{100k} + \gamma_{101}(FDK_{jk}) + \gamma_{102}(CLASSSIZE_{jk}) + \gamma_{103}(CLASSBEHVR_{jk}) + \mu_{10jk}$$

$\beta_{11jk} = \gamma_{110k}$

. . .

$\beta_{15jk} = \gamma_{150k}$

where γ_p are level-3 coefficients, μ_{0pjk} are level-3 random effects for intercept, and μ_{1pjk} are level-3 random effects for slope. Each level-3 coefficient became an outcome variable in the level-4 model.

Level 4, which can be understood as the between-school model, was specified as:

$\gamma_{000k} = \delta_{0000} + \delta_{0001}(SWPBIS_k) + \delta_{0002}(BEHSUPP_k) + \nu_{000k}$

$\gamma_{001k} = \delta_{0001}$

. . . .

$\gamma_{050k} = \delta_{0050}$

$\gamma_{100k} = \delta_{1000} + \delta_{1001}(SWPBIS_k) + \delta_{1002}(BEHSUPP_k) + \nu_{100k}$

$\gamma_{101k} = \delta_{1010}$

. . . .

$\gamma_{150k} = \delta_{1500}$

where δ_p are level-4 coefficients; ν_{0pjk} are level-4 random effects for intercept; and ν_{1pjk} are level-4 random effects for slope.

Chapter III: Results

Differences Between Included and Excluded ECLS-K:2011 Participants

As depicted in Table 2, an independent-samples *t*-test and chi-square analysis revealed significant mean differences between the included and excluded samples; however, in the context of Cohen's (1988) standards for effect size magnitude interpretation (i.e., $d \geq .2$ being "small," $d \geq .5$ being "medium," and $d \geq .8$ being "large"), the magnitudes of all differences may be considered trivial. The sizes of the analyzed samples may have led to the detection and amplification of small mean differences that generally leaned in favor of included children (e.g., higher self-regulation, higher SES). Accordingly, the following identified sample differences should be noted but cautiously interpreted.

Relative to excluded participants in the larger ECLS-K:2011 sample, included children were described by their teachers as having higher self-regulation at each time point (kindergarten Fall, $t[12{,}880^{1}] = 11.65$, $p < .001$, $d = .19$; kindergarten Spring, $t[15{,}540] = 12.00$, $p < .001$, $d = .19$; first-grade Spring, $t[13{,}360] = 2.21$, $p = .03$, $d = .04$; respective mean differences of .49, .47, and .09 points on 7-point Likert-type scale). Included children were also older ($t[15{,}530] = 9.80$, $p < .001$, $d = .16$; mean difference of .70 months) and from higher SES backgrounds ($t[15{,}900] = 6.99$, $p < .001$, $d = .11$; mean difference of .09 on a standardized scale with a range spanning approximately the absolute values of 2). Relative to their excluded counterparts, included children were described by their kindergarten teachers as experiencing closer and less conflicted relationships with their teachers (closeness, $t[15{,}580] = 10.03$, $p < .001$, $d = .16$; conflict, $t[15{,}700] = -7.94$, $p < .001$, $d = .13$; respective mean differences of .10 and –.10 points on a 7-point Likert-type scale), and they attended smaller classes ($t[12{,}660] = -3.11$, $p = .002$, $d = .05$;

[1] Degrees of freedom are rounded to the nearest 10 per IES restricted-use guidelines.

mean difference of less than 1 classmate [.27]) with higher levels of appropriate class-level behavior (t[15,020] = 2.61, p = .009, d = .04; mean difference of .04 points on a 5-point Likert-type scale). By contrast, included children were also less likely to attend a school with access to behavioral support services compared to excluded counterparts (χ^2[1] = 10.38, p = .001, d = .06; – 2.72%).

Descriptive Statistics and Correlations

For outcome and predictor variables at each respective level, descriptive statistics and correlations are presented in Table 3 for student-level variables, Table 4 for classroom-level variables, and Table 5 for school-level variables. All model variables were found to have skewness and kurtosis statistics within the range of absolute values for 2 and for 7, respectively, indicating no substantial issues with normality (West, Finch, & Curran, 1995). Further, no correlations exceeded a magnitude of .80, at which point multicollinearity may threaten the integrity of analyses (Mason & Perrault, 1991).

Self-regulation was significantly correlated for each pair of measurement occasions (kindergarten Fall with kindergarten Spring, r = .741, p < .001; kindergarten Fall with first-grade Spring, r = .529, p < .001; kindergarten Spring with first-grade Spring, r = .578, p < .001), with the magnitude for that of kindergarten Fall with kindergarten Spring significantly greater than that of both kindergarten Fall with first-grade Spring (t[8,130] = 31.51, p < .001) and kindergarten Spring with first-grade Spring (t[8,130] = 23.85, p < .001). At the level of the student (see Table 3), all pairs of student-level variables and of student-level variables with outcome variables were significantly correlated except for age with first-grade Spring self-regulation, SES, and student-teacher closeness; and gender with SES. All pairs of classroom-level variables and of classroom-level variables with outcome variables were also significantly

correlated (see Table 4). For school-level variables, however, only one significant correlation was found: for SWPBIS implementation and access to behavioral support staff ($r = .140$, $p < .001$) (see Table 5).

Multilevel Effects on Self-Regulation Growth and Outcomes

Data transferred from SPSS 24.0 into HLM 7.0 included approximately 24,650 time units at level 1; 8,200 students at level 2; 2,330 classrooms at level 3; and 740 schools at level 4. Results of fully unconditional model testing are presented in Table 6. With 38.95% of variance in self-regulation scores being explained as a function of time, a significant amount of variance in self-regulation across time points was found at the levels of the student (ICC = 53.59%; $\chi^2[5,150] = 3,0062.36$, $p < .001$), classroom (ICC = 5.19%; $\chi^2[1,580] = 1,981.03$, $p < .001$), and school (ICC = 2.27%; $\chi^2[740] = 940.21$, $p < .001$), justifying the use of a four-level model. Of the variance not explained by time, 87.78% was explained at the level of the student, with 8.50% and 3.72% explained at the levels of the classroom and school, respectively. Thus, compared to what was hypothesized, a larger percentage of variance was found to be explained at the level of the student, and smaller percentages of variance were explained at the levels of the classroom and school.

Growth trajectories. An unconditional model of linear growth was next tested to examine the effect of time on self-regulation and whether such growth varies by child. Results indicate that, overall, self-regulation as rated by teachers did not significantly change as a linear function of time across the approximately 17-month period from kindergarten Fall to first-grade Spring ($t[1,480] = 1.47$, $p = .14$); however, growth trajectories significantly varied among children ($\chi^2[5,150] = 8,858.97$, $p < .001$), classrooms ($\chi^2[1,580] = 2,334.64$, $p < .001$), and even schools ($\chi^2[740] = 964.19$, $p < .001$). Thus, the growth term and associated random effects for

both slope (i.e., self-regulation growth across kindergarten and first grade) and intercept (i.e., self-regulation at first-grade Spring) at each level were maintained in the developing model.

Contributions of student-level factors. To examine prediction of self-regulation at the level of the student, the child characteristics of age (grand-mean-centered), sex (with the intercept representing being male), and SES (grand-mean-centered) as fixed effects on growth across kindergarten and first grade and self-regulation at first-grade Spring were added to the model. Each significantly predicted self-regulation at first-grade Spring (age, $t[2{,}070] = 2.72$, $p = .007$; sex, $t[2{,}070] = 24.51$, $p < .001$; SES, $t[2{,}070] = 17.23$, $p < .001$), but only age ($t[2{,}070] = -5.68$, $p < .001$) and sex ($t[2{,}070] = 2.62$, $p = .009$), and not SES ($t[2{,}070] = -.88$, $p = .38$), significantly predicted growth across the kindergarten and first-grade years. Specifically, being younger and female was associated with greater self-regulation growth across kindergarten and first grade, and being older, female, and from a higher SES background was associated with higher self-regulation at first-grade Spring.

These effects are modeled in Figure 2 for age, Figure 3 for sex, and Figure 4 for SES. As shown in Figure 2, initial gaps in self-regulation at kindergarten Fall by age, with older children rated with the highest levels, largely narrowed by first-grade Spring. By contrast, a sex gap in self-regulation widened across the kindergarten and first-grade years (see Figure 3), per a generalized small decline in self-regulation for boys and growth in self-regulation for girls. Further, trajectories in self-regulation for children across SES levels were generally parallel (see Figure 4), with children from the highest SES beginning kindergarten with the highest self-regulation and from the lowest SES beginning kindergarten with the lowest self-regulation; these SES-related gaps generally sustained across the kindergarten and first-grade years.

Next, the fixed effect for SES on growth was removed from the model, and prediction by

dyadic student-teacher relationship dimensions as reported by kindergarten teachers was tested with the model additions of closeness and conflict, each grand-mean-centered, as fixed effects on self-regulation growth across kindergarten and first grade and self-regulation at first-grade Spring. Both closeness and conflict were significant predictors of self-regulation growth across kindergarten and first grade (closeness, $t[2,070] = -6.00$, $p < .001$; conflict, $t[2,070] = 7.87$, $p < .001$) as well as self-regulation at first-grade Spring (closeness, $t[2,070] = 2.95$, $p = .004$; conflict, $t[2,070] = -35.97$, $p < .001$), with all previously tested predictors remaining significant. Children with whom teachers described having higher levels of student-teacher closeness were reported as demonstrating less self-regulation growth across kindergarten and first grade but higher self-regulation at first-grade Spring (see Figure 5). The opposite was found for student-teacher conflict: Children with whom teachers described having higher levels of conflict were reported as demonstrating greater self-regulation growth across kindergarten and first grade but lower self-regulation at first-grade Spring (see Figure 6). Thus, study hypotheses were corroborated for self-regulation outcomes but not growth.

With all tested fixed effects being significant and none thereby being removed, the final level-2 model explained 20.36% of between-student (within-classroom, within-school) variance; a significant amount of variance in both self-regulation growth across kindergarten and first grade and self-regulation at first-grade Spring was left unexplained at this level (slope, $\chi^2[5,140] = 8,597.65$, $p < .001$; intercept, $\chi^2[5,140] = 15,498.33$, $p < .001$).

Contributions of classroom-level factors. At the level of the classroom, kindergarten schedule (with the intercept representing HDK), class size (grand-mean-centered), and class-level behavior (grand-mean-centered) were added as fixed effects on both self-regulation growth across kindergarten and first grade and self-regulation at first-grade Spring. For self-regulation

growth across kindergarten and first grade, only class-level behavior was a significant predictor (kindergarten schedule, $t[840] = -1.98$, $p = .05$; class size, $t[840] = -.32$, $p = .75$; class-level behavior, $t[840] = -2.67$, $p = .008$). For self-regulation at first-grade Spring, class size and class-level behavior, but not kindergarten schedule, were significant predictors (kindergarten schedule, $t[840] = -1.18$, $p = .24$; class size, $t[840] = 2.53$, $p = .012$; class-level behavior, $t[840] = 2.92$, $p = .004$). Thus, kindergarten schedule did not meaningfully contribute to explaining heterogeneity in self-regulation trajectories. Effects for kindergarten class size are presented in Figure 7 and for kindergarten class-level behavior are presented in Figure 8. As evident in Figure 7, trajectories according to kindergarten class size were nearly parallel, whereas, as evident in Figure 8, trajectories according to kindergarten class-level behavior revealed narrowing gaps across the kindergarten and first-grade years. Some associations at the classroom level were found in the directions opposite to those hypothesized, in that children were described as (a) making greater self-regulation growth across the kindergarten and first-grade years when they attended kindergarten classrooms with lower class-level appropriate behavior and as (b) exhibiting greater self-regulation at first-grade Spring when they attended larger kindergarten classes. Consistent with one hypothesis, however, results also suggest that children had greater self-regulation at first-grade Spring when they attended kindergarten classrooms with higher class-level appropriate behavior.

With the removal of the nonsignificant fixed effects on self-regulation at first-grade Spring for kindergarten schedule and on kindergarten-through-first-grade self-regulation growth for kindergarten schedule and class size, the final level-3 model explained 16.79% of between-classroom (within-school) variance, with a significant amount of unexplained variance in both self-regulation growth across kindergarten and first grade and self-regulation at first-grade

Spring remaining at this level (slope, $\chi^2[1,580] = 2{,}297.48$, $p < .001$; intercept, $\chi^2[1,580] = 1{,}876.39$, $p < .001$).

Contributions of school-level factors. Finally, at the level of the school, the remaining variables of SWPBIS implementation (with the intercept representing non-implementation relative to implementation) and access to behavioral support staff (with the intercept representing a lack of access relative to access) were added to the model for testing. As might be inferred from the results of correlational testing, neither factor significantly predicted self-regulation growth across kindergarten and first grade (SWPBIS, $t[4,450] = .41$, $p = .68$; behavioral support staff, $t[4,450] = 1.67$, $p = .10$) or self-regulation at first-grade Spring (SWPBIS, $t[4,450] = 1.33$, $p = .18$; behavioral support staff, $t[4,450] = .93$, $p = .35$). Thus, these variables were removed from the model, and the final model contained no level-4 predictors accounting for between-school variance.

Final model. The mixed-model equation for the final model is specified below.

$$
\begin{aligned}
SELFREG_{tijk} = {} & \delta_{0000} + \delta_{0010}*\text{CLASSSIZ}_{jk} + \delta_{0020}*\text{CLASSBEH}_{jk} + \delta_{0100}*\text{X1KAGE\_R}_{ijk} \\
& + \delta_{0200}*\text{FEMALE}_{ijk} + \delta_{0300}*\text{X12SESL}_{ijk} + \delta_{0400}*\text{X2CLSNSS}_{ijk} \\
& + \delta_{0500}*\text{X2CNFLCT}_{ijk} + \delta_{1000}*TIMEX4_{tijk} + \delta_{1010}*TIMEX4_{tijk}*\text{CLASSBEH}_{jk} \\
& + \delta_{1100}*TIMEX4_{tijk}*\text{X1KAGE\_R}_{ijk} + \delta_{1200}*TIMEX4_{tijk}*\text{FEMALE}_{ijk} \\
& + \delta_{1300}*TIMEX4_{tijk}*\text{X2CLSNSS}_{ijk} + \delta_{1400}*TIMEX4_{tijk}*\text{X2CNFLCT}_{ijk} \\
& + r_{0ijk} + r_{1ijk}*TIMEX4_{tijk} + u_{00jk} + u_{10jk}*TIMEX4_{tijk} + v_{000k} + v_{100k}*TIMEX4_{tijk} \\
& + e_{tijk}
\end{aligned}
$$

Coefficients, significance levels, and standard errors for variables in the final model are presented in Table 7. Model assumptions were tested by examining the linearity of predictors with outcomes, the normality and homoscedasticity of level-1 residuals, and the normality of

upper-level random effects, given that multivariate normality and homogeneity of variance cannot currently be analyzed for four-level models (Raudenbush et al., 2011). Graphed data indicated generally linear relationships for predictor variables and outcomes. Graphed level-1 residuals displayed a generally normal distribution, and level-1 residuals plotted against predicted values of self-regulation indicated no causes for concern. Further, histograms of empirical Bayes residuals for random effects on the intercept and slope at levels 2, 3, and 4 typically revealed generally normal distributions; however, that of the slope (i.e., self-regulation growth across kindergarten and first grade) at level 2 (i.e., students) displayed a negative skew, indicating that the model consistently predicted more kindergarten-through-first-grade growth in self-regulation across children than what was observed. This assumption violation, albeit a minor one, was not surprising given the nonsignificant finding for an effect of time on self-regulation in the context of prior work indicating that development of directly assessed self-regulation is best represented quadratically as opposed to linearly, with growth tapering off as children enter formal schooling (Best & Miller, 2010; Montroy, Bowles, Skibbe, McClelland, & Morrison, 2016). As previously mentioned, quadratic growth could not be tested in the current study due to measurement limitations. Nonetheless, this violation signifies that future work would be well-advised to consider quadratic representations of self-regulation development and, thus, to include multiple points of measurement to facilitate such analyses.

Chapter IV: Discussion

Self-regulation is a component of resilience critical to functioning and well-being across development (Masten, 2001, 2014) but particularly important for young children beginning formal schooling (Blair & Diamond, 2008; Raver, 2012; Shapiro, 2000; Ursache et al., 2012; Zelazo et al., 2016). Understanding heterogeneity in early elementary trajectories of self-regulation may be crucial to ensuring the efficiency and effectiveness of school-based prevention and intervention efforts (Guare, 2014). The current study examined teacher-rated classroom behavior self-regulation across kindergarten and first grade in relation to student characteristics and malleable contextual factors at the levels of proximal and distal processes.

In sum, findings indicate that self-regulation development across kindergarten and first-grade, as reflected in classroom behavior and described by teachers, is not well represented as linear growth and that such development does differ widely across students, classrooms, and schools. Further, variance in children's self-regulation occurred most prominently at the levels of time and students as well as, to a lesser extent, the levels of classrooms and schools. Children were described by their kindergarten and first-grade teachers as demonstrating the most self-regulation growth across kindergarten and first grade when they were younger and female; when their kindergarten teachers reported experiencing lower relational closeness and higher relational conflict with them; and when they attended kindergarten classes with lower levels of appropriate classroom behavior. Moreover, children were rated by their first-grade teachers as exhibiting higher self-regulation at first-grade Spring when they were older, female, and from high-SES backgrounds; when their kindergarten teachers reported experiencing higher relational closeness and lower relational conflict with them; and when they attended larger kindergarten classes with higher levels of appropriate classmate behavior. Thus, predictive relations differed for self-

regulation growth and outcomes, revealing a nuanced picture of development according to the point of evaluation.

A primary consideration in interpreting study findings is the issue of measurement error. That is, measurement error may explain the significance of some findings or confound some patterns in results (e.g., Waterman, McDermott, Fantuzzo, & Gadsden, 2012). For example, trajectory modeling may have been affected by first-grade teachers rating children's self-regulation at the trajectory end-point. With a small self-regulation mean rating decline between kindergarten Spring and first-grade Spring, first-grade teachers may have held more stringent expectations for classroom behavior as compared to kindergarten teachers; alternatively, though, they may have witnessed truly lower levels of self-regulated classroom behavior (e.g., in response to heightened demands and more challenging instruction). Additionally, measurement error might be linked with kindergarten schedule, with HDK teachers spending less time with students compared to FDK teachers and, thereby, potentially providing more favorable behavior ratings with higher measurement error. The possible confound of measurement error in teachers' ratings suggests potential utility in developing alternative methods of measuring self-regulation as a dimension of social competence, moving beyond rating scale data while maintaining foci on the situational specificity of classroom behavior and on measures' ecological validity for school-based research.

Alternatively, findings may truly suggest that self-regulation is reliably associated with contextual factors, and, if this is the case, there are multiple potential explanations for the associations of self-regulation with contextual factors. Contextual factors might differentially support self-regulation development; children may make greater gains in self-regulation *because*, for example, they are exposed to more classmate misbehavior and teacher redirection, which

may provide scaffolded opportunities for students to apply self-regulation in the classroom. This explanation identifies contextual factors as causal agents of behavioral development that might serve as early intervention targets. On the other hand, it could be that these contextual factors are not causally connected to self-regulation and are rather simply related to more or less opportunity for self-regulation growth; for example, children may make greater self-regulation gains in classes with high levels of inappropriate behavior because they contribute to this inappropriate behavior and exhibit low initial levels of self-regulation, such that they have more room to grow, regardless of whether the classroom context supports self-regulation development. Alternatively, in the case of dynamic variables (in this study, student-teacher relationship dimensions and class-level behavior), contextual factors might instead be affected, transactionally or otherwise, by students' demonstration of self-regulation (e.g., children may experience closer and less conflicted relationships with their teachers in part *because* they demonstrate heightened self-regulation) (Portilla, Ballard, Adler, Boyce, & Obradovic, 2014). The purpose of the current study, however, was to consider contextual factors in relation to self-regulation as a means of assessing their potential as intervention targets and not to evaluate cause-and-effect relations, which should be made a priority of future research.

Consideration of Potential Risk Factors and Malleable Factors

Given notable differences in findings according to the focus of analysis, results are discussed below according to prediction of trajectory growth and trajectory outcomes (i.e., end-points).

Predictors of trajectory growth. Whereas teachers described younger children as making greater growth in self-regulation across the early elementary years, they also described self-regulation gaps as persisting for children based on SES and as widening for boys and girls.

Assuming unbiased teacher reporting according to child SES and sex, this implies the need for interventions to accelerate the self-regulation development of children from low-SES backgrounds and boys. It has been repeatedly demonstrated that children with the initially lowest levels of self-regulation gain the most from participating in early intervention (Diamond & Lee, 2011; Diamond & Ling, 2016), often resulting in differential intervention effects on children from low-income backgrounds (e.g., Raver, 2012) and boys (e.g., Moffitt et al., 2011). In fact, Raver (2012) has suggested that self-regulation may be the key mediator of children's poverty-related adversity and that targeting the self-regulation of children from low-income backgrounds may largely offset the negative long-term effects of socioeconomic disadvantage. Further, a large body of research demonstrates that teachers commonly rate girls as exhibiting more behavioral strengths and fewer at-risk behaviors relative to boys (e.g., DiStefano, Ene, & Leighton, 2016), such that others have called for early intervention practices targeting the overall behavioral development of boys (e.g., Graves, Blake, & Kim, 2012). Differences in cognitive development, parenting, and socialization practices reliably associated with child sex (Leman & Tenenbaum, 2014) might explain these distinct behavioral trajectories for boys and girls. It could also be, however, that teacher ratings are biased as a function of child sex, and that strategies to increase accurate appraisal could improve the accuracy of measurement and the quality of interactions among early educators and young boys.

Although children with teacher-reported high relational closeness and low relational conflict had higher self-regulation at first-grade Spring, children with teacher-reported low closeness and high conflict had greater self-regulation growth across kindergarten and first grade. Teachers also described children as displaying greater growth in self-regulation when their kindergarten classes had low class-level appropriate behavior, despite high class-level

appropriate behavior being associated with higher self-regulation at first-grade Spring. These discrepant findings across trajectory foci (i.e., growth versus end-point) suggest that experiencing low student-teacher closeness and high student-teacher conflict and attending kindergarten classes with low class-level appropriate behavior simply correspond with children having more room for self-regulation growth (i.e., exhibiting low self-regulation at kindergarten entry). Likely, this observed growth largely reflects students' self-regulation scores regressing to the mean. At each measurement occasion, too, these levels of these contextual factors corresponded with lower self-regulation (see Figures 5, 6, and 8), further advancing the argument that greater growth is not causally attributable to the associated levels of the contextual factors. Therefore, this study supports the conceptualization of low relational closeness, high relational conflict, and high kindergarten class-level misbehavior as malleable risk factors for delayed behavioral development and potential targets of intervention. These risk factors are identified in the context of intervention research also documenting positive effects on self-regulation by shaping student-teacher interactions (e.g., Dias & Seabra, 2017) and administering intervention activities class-wide (e.g., Schmitt, McClelland, Tominey, & Acock, 2015).

Predictors of trajectory outcomes. Findings also indicate that being younger, male, and from low-SES backgrounds are unique child-level risk factors for entering second grade without levels of classroom behavior self-regulation comparable to counterparts. Regarding dyadic factors, high relational closeness and low relational conflict reported by kindergarten teachers were associated with higher outcomes at first-grade Spring. Given prior research indicating the utility of relationship-focused interventions (e.g., Raver et al., 2011) and also the extent to which teacher bias is interwoven into behavior rating methods (e.g., Waterman et al., 2012), the association between student-teacher relationship dimensions and self-regulation outcomes is

likely a transactional one (Portilla et al., 2014). Specifically, it could be that children's demonstration of heightened classroom behavior self-regulation leads to teachers' perceptions of closer and less conflicted student-teacher relationships, but also that children's experience of high relational closeness and limited relational conflict further foster children's development of self-regulation.

Additionally, first-grade teachers described children as displaying higher self-regulation outcomes when they attended larger kindergarten classes and kindergarten classes with higher class-level appropriate behavior. Larger classes might differentially support self-regulation development by providing more opportunities for students' skill development outside the context of teachers' external regulation of behavior, whereas smaller classes might involve more adult direction and foster less student independence. Alternatively, it could be that highly capable teachers are "rewarded" with larger classes and positively impact their students' self-regulation by providing highly effective organizational and emotional supports. That is, it may not truly be the size of the class that matters but rather teachers' provision of opportunities for self- (as opposed to external-) regulation and use of effective classroom management practices that make the difference. Additional work with more objective measures is needed to clarify the intervention target potential of class-size manipulation, with particular attention to interactions of class size with variables related to classroom activities (e.g., opportunities for independent or small-group work), interactions (e.g., teachers' external regulation of behavior), and composition (e.g., class-level behavior). On the other hand, the finding for class-level behavior further corroborates its viability as an intervention target.

Non-significant predictors. The non-significant findings for several contextual factors (i.e., kindergarten schedule, SWPBIS implementation, and access to behavioral support staff) in

relation to self-regulation trajectories warrant consideration.

First, children's kindergarten schedule was not reliably associated with self-regulation growth across kindergarten and first grade or self-regulation at first-grade Spring. It was hypothesized that children would make greater growth and have greater outcomes when attending FDK, relative to HDK, given the likelihood of more exposure to direct instruction and diverse peer interactions. With small-magnitude, negative correlations found for FDK and self-regulation outcomes at each measurement period (see Table 4), it could instead be, however, that heightened demands associated with attending kindergarten for a longer period each day overtax FDK students' self-regulation abilities, resulting in the demonstration of more dysregulated behavior (i.e., less social competence) compared to their counterparts in HDK classes. Additionally, attendance of FDK classes could be reliably associated with other factors for which the tested model otherwise accounts, such that variance explained by FDK attendance may have been previously "claimed" by other tested predictors. These factors could include demographic ones (e.g., SES, with students from low-SES backgrounds, relative to counterparts, demonstrating greater needs and being more likely to be found eligible for FDK participation) or contextual ones (e.g., class size, with FDK being associated with smaller classes). Thus, results of the current study should not be considered conclusive evidence of FDK failing to extend benefits to behavioral development. Replicating the current study's model with otherwise assessed (e.g., directly observed) self-regulation may offer a less confounded route to exploring a similar research question.

Moreover, although a significant amount of variance in self-regulation was found at the level of the school, this amount was much smaller than those attributable to classrooms, students, and time; however, variance shared among levels was likely claimed by lower levels in analyses,

leaving little variance left to be claimed at the uppermost (i.e., school) level. In addition, neither school-level predictor (i.e., SWPBIS implementation or access to behavioral support staff) significantly contributed to explaining heterogeneity in trajectories. From a statistical viewpoint, with little variance available to be explained at the level of the school, any given school-level predictor would possess elevated risk of Type II error (i.e., its relationship with self-regulation trajectories found to be not statistically significant when a relationship does, in fact, exist) due to being able to explain a percentage of only a small amount of variance. It should be noted, though, that correlations for each considered school-level predictor with teacher ratings of self-regulation were far from being statistically significant, such that a shortcoming of statistical modeling is likely not the case. Therefore, results could be interpreted as suggesting that schools' adoption of SWPBIS and provision of behavioral support staff do not meaningfully support students' classroom behavior self-regulation; however, alternative explanations are likely more suitable.

Specifically, findings may contribute to a growing body of evidence that it is not *whether* SWPBIS is adopted by a school but rather *how, how well*, and *how consistently* it is implemented that matters (e.g., Childs et al., 2010, 2016). The current study did not examine implementation fidelity (i.e., quality) and integrity (i.e., protocol adherence) (Fabiano, Chafouleas, Weist, Sumi, & Humphrey, 2014) due to a lack of available data. Future large-scale data collection efforts are encouraged to collect more nuanced information regarding SWPBIS implementation; further, local and state-wide SWPBIS evaluation projects are encouraged to broaden their outcome measurement foci to more closely consider students' prosocial behavioral development.

Finally, with regards to behavioral support staff, it is probable that mere access does not correspond with improved student outcomes. Factors related both to teachers' utilization of

behavioral support staff (e.g., perceptions of staff's availability, willingness to contact staff, implementation of staff's recommendations) and to characteristics of behavioral support staff (e.g., availability to consult with teachers or directly intervene with students; relationships with teachers and students; training, competence, and prior experience) may be more important indicators of students' trajectories. Such would suggest the importance of schools' ongoing evaluation of behavioral support staff's roles and opportunities, including promoting behavioral support staff's integration within school faculties and providing meaningful in-service training.

Summary. The current study's results demonstrate reliable linkages with self-regulation trajectories that may be used to advance the science of promoting children's classroom behavior self-regulation, be it by directing services to those with identified child or contextual risk factors or by designing and evaluating interventions targeting identified malleable factors. In cases when resources prohibit larger-scale efforts, the risk factors of (a) being younger, (b) being male, (c) being from a low-SES background, experiencing (d) low student-teacher closeness and (e) high student-teacher conflict, and (f) attending a class with low levels of peer-displayed appropriate behavior might be considered in identifying children to receive support for classroom behavior self-regulation. Findings for class-level behavior in tandem with a broader literature base (e.g., Conroy et al., 2008; Sugai & Horner, 2006), however, indicate that universal service delivery may be increasingly impactful. Less stark findings related to class size (see Figure 7) indicate that attending larger kindergarten classes—likely, classes in which there are more opportunities for independence and self-regulation—may be differentially supportive of self-regulation outcomes. With these latter four factors (i.e., student-teacher closeness, student-teacher conflict, class-level behavior, opportunities for self-regulation) being malleable, they also represent potential viable targets for early intervention.

There is a clear need for the development of strategies targeting self-regulation that are neither comprehensive nor resource-intensive and are also ecologically valid for use in classrooms (Schmitt et al., 2015; Tominey & McClelland, 2011). That is, most existing early interventions focus not specifically on self-regulation but rather on an array of social-emotional and learning-related skills, resulting in potentially diluted effects on self-regulation outcomes. Given self-regulation is a resilience factor that largely facilitates academic learning as well as adaptive behavior and interpersonal processes (e.g., Masten, 2001, 2014), more narrowly targeting self-regulation may have profound effects on multiple aspects of functioning, such that it may represent a more efficient but also extensive means of promoting students' learning and resilience (Shapiro, 2000). Most comprehensive social-emotional curricula (e.g., Tools of Mind, Bodrova & Leong, 2007) or social-emotional curricular add-ons (e.g., the Incredible Years, Incredible Years, 2013; Promoting Alternative Thinking Strategies [PATHS], Kusche & Greenberg, 1994) that have been evaluated as supporting children's self-regulation development are expensive and require extensive training and external support for school practitioners to implement. Such existing programs may be accessible to practitioners and sustainable in only limited circumstances.

Approaches to intervention representing exceptions in that they have been identified as meaningfully supporting self-regulation while also meeting the criteria of (a) specifically targeting self-regulation, (b) requiring neither extensive cost nor time, and (c) demonstrating ecological validity for classroom applications are rare, even when considering the distinct constructs of self-regulation together (i.e., self-regulation both directly measured and measured via informant report). For the outcome of self-regulation as a dimension of social competence, these exceptions include a series of playgroup activities designed for preschoolers (Schmitt et al.,

2015) and an in-service development program for pre-kindergarten teachers (Dias & Seabra, 2017). The current study meaningfully contributes to this literature by not only revealing associations with self-regulation trajectories but also by identifying (a) subpopulations at highest risk for exhibiting delayed self-regulation development and (b) malleable factors viable for targeting in the context of a dearth of focused, accessible intervention strategies suitable for classroom implementation.

Limitations

Study contributions notwithstanding, several limitations constrain the extent to which results can be meaningfully interpreted and applied. First, and perhaps most prominently, the study's substantial reliance on teacher-reported data, though currently central to the understanding of self-regulation as a dimension of social competence (Toplak et al., 2013), likely introduced additional measurement error, largely in the form of subjectivity (e.g., Waterman et al., 2012). Accounting for classroom-level (i.e., teacher-level) variance in the model was expected to help, but certainly not fully, address this issue. Second, as a function of limitations within the dataset and statistical software employed, a large subset of the ECLS-K:2011 cohort was excluded to allow the modeling of trajectories. Included and excluded child participants were found to vary on most model variables, though the effect sizes of such differences were all trivial. Third, student mobility may have played a role in influencing study findings. Children who changed classrooms mid-year or changed schools in kindergarten or first grade were excluded from analyses, and their early elementary trajectories should be the focus of future research aimed at clarifying how to promote the behavioral development and adjustment of mobile students. In addition, the tested model accounted only for students' nesting within classrooms and schools during their kindergarten year, as cross-classification (i.e., students'

nesting within classrooms and schools changing across time points) is currently not available for models with more than two levels (Raudenbush et al., 2011). This means that systematic differences in children's first-grade experiences and in their teachers' reported data may have affected the modeled trajectories and the intercepts estimated at first-grade Spring.

Fourth, and as elsewhere recognized, although self-regulation growth in early childhood may be best represented quadratically, at least when directly assessed (Best & Miller, 2010; Montroy, Bowles, Skibbe, McClelland, & Morrison, 2016), the current study could evaluate only a linear growth term due to a maximum of three measurement occasions being available for the outcome of self-regulation. This is a result of the CBQ being administered in the ECLS-K:2011 only in kindergarten Fall, kindergarten Spring, and first-grade Spring, with measurement changing in second grade as a function of the assessment age range. Fifth, and also related to measurement, some contextual variables considered in this study might be more validly or reliably evaluated using different instruments or methods, such as by collecting students' perceptions of their relationships with teachers in addition to teachers' perceptions (see Murray, Murray, & Waas, 2008) or by directly observing class-level behavior rather than using a single-item teacher rating. Additionally, considering kindergarten schedule in terms of not only duration but also the timing (i.e., morning versus afternoon HDK attendance) may reveal nuanced findings, for example, as a function of children potentially displaying different levels of self-regulation across the day and/or teachers potentially demonstrating different levels of attunement or sensitivity across the day. Sixth and finally, the current study's model did not evaluate a range of possible within- and cross-level interactions and random effects that might meaningfully contribute to understanding heterogeneity in trajectories, as their addition to the complex model evaluated might have led to, statistically, issues with convergence and,

conceptually, muddled findings. Such interactions and random effects should be considered in the future in evaluating less comprehensive models with more targeted foci (e.g., fewer variables).

Future Directions in Research and Practice

Findings of the current study reveal several directions of future empirical and practical development important to advancing the knowledge base regarding self-regulation development and the practice of supporting children's self-regulation. Namely, these areas include elucidating contextual contributions to self-regulation development, investigating intervention effects on self-regulation, clarifying trajectories and relations across self-regulation constructs, and advancing the measurement of self-regulation.

Elucidating contextual contributions to self-regulation development. Additional school contextual factors not directly evaluated in the current study may prove important to understanding self-regulation trajectories as well as opportunities for early identification and intervention. For example, findings suggest that teacher and classmate behaviors profoundly influence students' self-regulation development; future research may look more closely at identifying what specific behaviors, enacted in what conditions, best support this development, and for whom. Continued empirical inquiry into the relations of behavioral development with proximal and distal school factors may reveal novel foci for both targeted and systems-level intervention.

Further, the current study evaluated multiple salient school contextual factors in relation to self-regulation development but did not consider contextual factors beyond those in schools. Much of children's self-regulation development occurs before they enter formal schooling environments (e.g., Montroy, Bowles, Skibbe, McClelland, & Morrison, 2016), and early home

experiences likely play an even more critical role in shaping self-regulation development compared to school experiences. A multitude of studies point to behavioral-developmental advantages for young children who experience home contextual factors such as secure attachments with caregivers (e.g., Bernier, Beauchamp, Carlson, & Lalonde, 2015) and sensitive, responsive parenting that supports children's autonomy (e.g., Vernon-Feagans, Willoughby, Garrett-Peters, & The Family Life Project Key Investigators, 2016). These benefits, however, have been found to vary widely according to cultural, familial, and child-level characteristics (e.g., Holochwost et al., 2016; Ursache, Noble, & Blair, 2015), such that effectively selecting targets of home-focused early intervention may be more complex than suggested by prior research. Additional research is needed to document differences in self-regulation trajectories according to home and familial factors as well as to examine means by which practitioners may positively impact contextual factors beyond the school in the service of students' self-regulation development.

Investigating intervention effects on self-regulation. To better expound the roles of contextual factors in children's development of classroom behavior self-regulation, additional research is needed that examines the experimental effects of contextual factor manipulation on self-regulation levels. Specifically, this research might encompass cluster-randomized trials of interventions targeting student-teacher relationships, class-level behavior, and, if met with additional empirical support, factors likely related to class size, such as teachers' classroom management practices. An absence of treatment effects found for any such investigation would suggest not only the likelihood of potential issues with intervention quality, dosage, implementation, and/or evaluation but also the possibility of an above-specified alternative hypothesis as explaining current study findings.

Otherwise, promising treatment effects would point to the need to explore moderators and mediators (i.e., respectively, for whom did the intervention work, and why/how did the intervention work?) to maximize the efficiency and effectiveness of intervention efforts. For example, a range of class-wide interventions targeting students' demonstration of appropriate classroom behavior is available (Conroy et al., 2008), but evaluation has typically considered increases in classroom engagement and/or decreases in disruptive behaviors (Briesch, Hemphill, Volpe, & Daniels, 2015) rather than specifically examining self-regulation growth. Intervention research exploring effects of class-wide behavioral interventions on children's self-regulation might consider moderation by student characteristics and class size (e.g., Does the intervention differentially support self-regulation development according to students' age, sex, SES, and/or class size?), mediation by student-teacher relationship dimensions (e.g., Does the intervention only support self-regulation development when students and teachers experience relationships marked by low levels of conflict?), as well as moderated mediation (e.g., Does the intervention only support self-regulation development when students and teachers experience relationships marked by low levels of conflict, and differentially so according to students' age, sex, SES, and/or class size, and?). To translate promising interventions into sustainable practice, special attention must also be paid to the social and ecological validity of intervention components as well as to implementation integrity and fidelity by practitioners in applied settings.

Clarifying trajectories and relations across self-regulation constructs. In recognition of self-regulation construct distinctiveness across measurement methods (Stichter et al., 2016; Toplak et al., 2013), results of the current study are likely limited to the conceptualization of self-regulation as a dimension of social competence and should not be used to infer characterization of trajectories and viable contextual supports for self-regulation as a cognitive

process. Additional work using directly assessed self-regulation, such as replication of the current study's model with self-regulation otherwise measured, is necessary to inform this research area.

Beyond this focus, however, there appears a need to clarify the entanglement of these two self-regulation constructs across development. For example, to what extent does self-regulation as a cognitive process predict self-regulation as a dimension of social competence, and what other child characteristics, abilities, and contextual factors explain incremental variance in self-regulation as a dimension of social competence? Further, does the predictive relationship for self-regulation as a cognitive process and self-regulation as a dimension of social competence vary as a function of age or diagnosis (e.g., with this relationship being weaker for younger children and children with identified internalizing or externalizing problems)? Given also the potential for self-regulation as a target of early intervention (e.g., Murray et al., 2015), examining the co-responsiveness of these two self-regulation constructs as well as differential responsiveness to intervention features may reveal important insights instructive to intervention and evaluation design efforts.

Advancing the measurement of self-regulation. As previously indicated, the study of self-regulation may also benefit from the development of new measures of children's self-regulation. Recognizing "the need to assess self-regulation both objectively and within context" (p. 32), Williford and Vick Whittaker (in Campbell et al., 2016) have likewise acknowledged the bias often embedded within behavior ratings, the limited social validity of direct assessment scores, and the need for naturalistic observation protocols suitable for classroom applications, explicitly reporting the absence of any observation measure designed specifically for the assessment of displayed self-regulation in naturalistic contexts. Despite the range of data

available for participants in the ECLS-K:2011, no observational data were collected. Large-scale studies (e.g., national surveys such as the ECLS-K) have shied away from employing observational measures due to the administration time they require (Halle & Darling-Churchill, 2016; Martin-McDermott & Fox, 2007), though the need to balance feasibility and quality (e.g., evidence of reliability and validity, utility of scores) is inherent in any data collection effort, and particularly in those in applied settings (Darling-Churchill & Lippman, 2016).

One viable option in harnessing both objectivity and contextualization in measurement while also ensuring feasibility and quality may be to develop a direct behavior rating (DBR) approach (Chafouleas, Christ, Riley-Tillman, Briesch, & Chanese, 2007; Chafouleas, Riley-Tillman, & Christ, 2009) to self-regulation assessment. DBR is a hybrid behavioral assessment approach designed to "capture the strengths of behavior rating scales and the benefits of systematic direct observation" (Chafouleas et al., 2009, p. 195) through one's observation of a pre-determined behavior for a specified period and subsequent rating(s) of that behavior's characteristic(s). Although such a measurement approach would nonetheless require observer training and administration time, and could potentially be compromised by observer bias (Chafouleas et al., 2007), employing DBR may reduce measurement error related to latency (i.e., the period between an informant's observation of behavior and evaluation of behavior) and inference (i.e., the informant's degree of objectivity in evaluating behavior) (Christ, Riley-Tillman, & Chafouleas, 2009) in the assessment of self-regulation. Further, a DBR approach may overcome the largely present and limiting issue of self-regulation measurement tools being specific to limited age ranges (Best & Miller, 2010) (e.g., with the CBQ designed for ages 3 to 7), allowing continuity in measurement for a range of populations and for longitudinal research. Thus, assuming adequate generalizability, a DBR approach may represent a feasible, high-

quality option for measuring self-regulation both in applied settings and in large-scale research. Clearly, research is needed to test the utility of this approach and to inform critical features of assessment such as number of items and item wording.

Conclusions

Early elementary students' competence in applying self-regulation to modulate their classroom behavior and accomplish academic and social goals appears to be dependent upon not only intraindividual faculties but also contextual aspects of their educational settings. Interventions targeting the self-regulation of children who are younger than classmates, male, and from low-SES backgrounds may be particularly impactful in enhancing school readiness. Further, early interventions aimed at strengthening classroom behavior self-regulation might consider targeting children's positive relationships with teachers, the availability of skill development opportunities outside adults' external regulation of behavior, and peers' modeling of self-regulated behavior. Research focused on understanding contextual predictors of self-regulation development, designing and evaluating new intervention approaches, examining relations among distinct constructs of self-regulation, and developing new self-regulation measurement methods may clarify much of the interpretation uncertainty present with the current study's results. Furthermore, such research may provide school practitioners with the tools—specifically, a rich understanding of child development and access to ecologically valid assessments and interventions—necessary to successfully support students' self-regulation and, thereby, social competence. By doing so early in students' development and education, school practitioners may be able to bolster trajectories in the direction of meaningfully facilitating learning and resilience.

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Table 1

Overview of Model Variables

Role in Analyses	Variable Name	Description	Levels
Time Variable	TIMEX4	Administration Time	0 = X4, –12 = X2, –17 = X1
Level 2 Identifier	CHILDID	Child Identification Number	Nominal
Level 3 Identifier	T1_ID	Fall 2010 Teacher Identification Number	Nominal
Level 4 Identifier	S1_ID	Fall 2010 School Identification Number	Nominal
Used to Compute Participant Exclusion Identifier	X12CHGSCH	X12 Child Changed Teachers Between Round 1 & 2	1 = did not, 2 = public to public, 3 = private to private, 4 = public to private, 5 = private to public, 6 = other
Computed Participant Exclusion Identifier	X12CHGSCH	X12 Child Changed Schools Between Round 1 & 2	0 = no, 1 = yes
Participant Exclusion Identifier	X12CHGTCH	X12 Child Changed Teachers Between Round 1 & 2	0 = no, 1 = yes
Used to Compute Outcome Composite	X1ATTNFS	X1 Teacher Report Attentional Focus (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X2ATTNFS	X2 Teacher Report Attentional Focus (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X4ATTNFS	X4 Teacher Report Attentional Focus (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X1INBCNT	X1 Teacher Report Inhibitory Control (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X2INBCNT	X2 Teacher Report Inhibitory Control (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X4INBCNT	X4 Teacher Report Inhibitory Control (CBQ)	Mean of 6-item, 7-point ordinal scale

Used to Compute Outcome Composite	X1SELFREG	X1 Teacher Report Self-Regulation Composite (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X2SELFREG	X2 Teacher Report Self-Regulation Composite (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X4SELFREG	X4 Teacher Report Self-Regulation Composite (CBQ)	Mean of 6-item, 7-point ordinal scale
Used to Compute Outcome Composite	X1SELFREG	Self-Regulation Composite (CBQ)	Mean of two 6-item, 7-point ordinal scale means
Used to Compute Outcome Composite	X2SELFREG	Self-Regulation Composite (CBQ)	Mean of two 6-item, 7-point ordinal scale means
Used to Compute Outcome Composite	X4SELFREG	Self-Regulation Composite (CBQ)	Mean of two 6-item, 7-point ordinal scale means
Outcome Composite	SELFREG	Self-Regulation Composite (CBQ), per TIMEX4	Mean of two 6-item, 7-point ordinal scale means
Level-2 Predictor	X1KAGE_R	X1 Child Assessment Age	Continuous (months)
Used to Compute Level-2 Predictor	X_CHSEX_R	Child Composite Sex - Revised	1 = male, 2 = female
Computed Level-2 Predictor	X_FEMALE	Female Status	0 = male, 1 = female
Level-2 Predictor	X12SESL_I	X12 Continuous SES Measure (Imputed)	Continuous
Level-2 Predictor	X2CLSNSS	X2 Teacher Report Closeness (STRS)	Mean of 7-item, 7-point ordinal scale
Level-2 Predictor	X2CNFLCT	X2 Teacher Report Conflict (STRS)	Mean of 7-item, 7-point ordinal scale
Used to Compute Level-3 Predictor	X1CLASS	X1 Child Program Type	Many categories recoded into: 1 = FDK, 2 = AM, 3 = PM

Computed Level-3 Predictor	FDK	Kindergarten Schedule	0 = HDK, 1 = FDK
Used to Compute Level-3 Predictor	A1ATOTAG	X1 Total Class Enrollment (Age) – AM	Continuous
Used to Compute Level-3 Predictor	A1PTOTAG	X1 Total Class Enrollment (Age) – PM	Continuous
Used to Compute Level-3 Predictor	A1DTOTAG	X1 Total Class Enrollment (Age) – AD	Continuous
Computed Level-3 Predictor	CLASSSIZE	Total Class Enrollment	Continuous
Used to Compute Level-3 Predictor	A1ABEHVR	A1 Teacher Rating of Class Behavior –AM	Ordinal 1–5
Used to Compute Level-3 Predictor	A1PBEHVR	A1 Teacher Rating of Class Behavior – PM	Ordinal 1–5
Used to Compute Level-3 Predictor	A1DBEHVR	A1 Teacher Rating of Class Behavior – AD	Ordinal 1–5
Computed Level-3 Predictor	CLASSBEHVR	Teacher Rating of Classroom Behavior	Ordinal 1–5
Used to Compute Level-4 Predictor	S4PSTBEH	S4 Positive Behavior Intervention/Support	1 = yes, 2 = no
Computed Level-4 Predictor	SWPBIS	School-Wide Positive Behavior Intervention/Support	0 = no, 1 = yes
Used to Compute Level-4 Predictor	A4STFBEHV	Use of Behavioral Support Services	1 = support received; 2 = support not received but available; 3 = support not available
Computed Level-4 Predictor	BEHSUPP	Access to Behavioral Support Services	0 = not available, 1 = available

Note. CBQ = *Children's Behavior Questionnaire* (Putnam & Rothbart, 2006). AM = half-day kindergarten, morning class. FDK = full-day kindergarten. HDK = half-day kindergarten. PM = half-day kindergarten, afternoon class. SES = socioeconomic status. STRS = *Student-Teacher Relationship Scale* (Pianta, 2001). X1 = Kindergarten Fall. X2 = Kindergarten Spring. X4 = First Grade Spring.

Table 2

Descriptive Statistics for Included and Excluded Participants on Model Variables

	Included (n^a = 8,220)		Excluded (*n* varies)						
	M	*SD*	n^a	*M*	*SD*	Mean diff.	*t*	df^a	*p*	*d*
X1 Self-Regulation	9.84	2.37	6,220	9.34	2.57	.49	11.65	12,780	<.001***	.19
X2 Self-Regulation	10.22	2.37	7,670	9.75	2.57	.47	12.00	15,540	<.001***	.19
X4 Self-Regulation	9.98	2.40	5,140	9.88	2.40	.03	2.21	13,360	.03*	.03
Age, in months	67.78	4.37	7,560	67.09	4.56	.70	9.80	15,530	<.001***	.16
SES	–.01	.80	7,790	–.10	.82	.09	6.99	15,900	<.001***	.11
Closeness	4.40	.61	7,740	4.30	.67	.10	10.03	15,580	<.001***	.16
Conflict	1.59	.77	7,740	1.69	.83	–.10	–7.94	15,700	<.001***	.13
Class Size	20.24	4.72	6,360	20.50	5.41	–.26	–3.11	12,660	.002**	.05
Class Behavior	3.33	.81	6,800	3.30	.83	.03	2.61	15,020	.009**	.04
	Included (n^a =8,200)		Excluded (*n* varies)						
	Percentage		n^a	Percentage	Difference	χ^2	*df*	*p*	*d*
Female	49.29%		9,940	48.36%	.93%	1.57	1	.21	.02

FDK	82.88%	7,720	81.96%	.92%	2.31	1	.13	.02
SWPBIS	72.29%	5,700	73.53%	–1.24%	2.61	1	.11	.03
Behavioral Support	65.99%	4,990	68.71%	–2.72%	10.38	1	.001**	.06

Note. FDK = full-day kindergarten. SWPBIS = school-wide positive behavior interventions and supports implementation. X1 = kindergarten Fall. X2 = kindergarten Spring. X4 = first-grade Spring. [a] Rounded to the nearest 10 in accordance with IES restricted-use guidelines for reporting sample size. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

Correlations and Descriptive Statistics for Outcome and Student-Level Variables

	1	2	3	4	5	6	7	8
1. X1 Self-Regulation	–							
2. X2 Self-Regulation	.741***	–						
3. X4 Self-Regulation	.529***	.578***	–					
4. Age	.065***	.052***	.006	–				
5. Female	.220***	.228***	.253***	–.076***	–			
6. SES	.173***	.162***	.192***	–.011	<.001	–		
7. Closeness	.280***	.366***	.188***	–.004	.181***	.102***	–	
8. Conflict	–.486***	–.587***	–.396***	.025*	–.171***	–.102***	–.377***	–
M	9.84	10.22	9.98	67.79	–	–.01	4.40	1.59
SD	2.37	2.37	2.40	4.37	–	.80	.61	.77
Minimum	2.00	2.00	2.00	49.08	0 = Male	–2.33	1.43	1.00
Maximum	14.00	14.00	14.00	85.04	1 = Female	2.60	5.00	4.86
Skewness	–.55	–.62	–.47	.44	.03	.25	–1.20	1.65

Kurtosis	–.31	–.18	–.50	.55	–2.00	–.42	1.20	2.15

Note. SES = socioeconomic status. X1 = kindergarten Fall. X2 = kindergarten Spring. X4 = first-grade Spring. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Correlations and Descriptive Statistics for Outcome and Classroom-Level Variables

	1	2	3	4	5	6
1. X1 Self-Regulation	–					
2. X2 Self-Regulation	.741***	–				
3. X4 Self-Regulation	.529***	.578***	–			
4. FDK	–.041***	–.052***	–.068***	–		
5. Class Size	.034***	.033**	.038**	–.028*	–	
6. Class Behavior	.148***	.139***	.104***	–.075***	–.105***	–
M	9.84	10.22	9.98	–	20.24	3.33
SD	2.37	2.37	2.40	–	4.72	.81
Minimum	2.00	2.00	2.00	0 = HDK	1	1
Maximum	14.00	14.00	14.00	1 = FDK	51	5
Skewness	–.55	–.62	–.47	–1.75	.57	–.22
Kurtosis	–.31	–.18	–.50	1.05	4.68	.08

Note. FDK = full-day kindergarten. X1 = kindergarten Fall. X2 = kindergarten Spring. X4 = first-grade Spring. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5

Correlations and Descriptive Statistics for Outcome and School-Level Variables

	1	2	3	4	5
1. X1 Self-Regulation	–				
2. X2 Self-Regulation	.741***	–			
3. X4 Self-Regulation	.529***	.578***	–		
4. SWPBIS	–.005	–.001	.003	–	
5. Behavioral Support	–.007	.001	.016	.140***	–
M	9.84	10.22	9.98	–	–
SD	2.37	2.37	2.40	–	–
Minimum	2.00	2.00	2.00	0 = No	0 = No
Maximum	14.00	14.00	14.00	1 = Yes	1 = Yes
Skewness	–.55	–.62	–.47	–1.00	–.68
Kurtosis	–.31	–.18	–.50	–1.01	–1.55

Note. SWPBIS = school-wide positive behavior interventions and supports implementation. X1 = kindergarten Fall. X2 = kindergarten Spring. X4 = first-grade Spring. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 6

Fully Unconditional Model for Self-Regulation

Statistic	Model	Level 2	Level 3	Level 4
Coefficient (Intercept)	10.01	–	–	–
σ^2	2.22	–	–	–
τ	–	3.06***	.30***	.13***
Reliability	–	.81	.20	.21
ICC	–	.54	.05	.02

Note. *** $p < .001$.

Table 7

Final Four-Level Model

Fixed Effects	Coefficient	*SE*
Level 2		
Intercept		
Slope	–.01	<.01
Intercept	9.61***	.04
Age		
Slope	<–.01***	<.01
Intercept	.02***	.01
Female		
Slope	.02***	<.01
Intercept	.87***	.05
SES		
Intercept	.38***	.02
Closeness		
Slope	–.02***	<.01
Intercept	.13**	.04
Conflict		
Slope	.02***	<.01
Intercept	–1.16***	.03
Level 3		
Class Size		

Intercept	.02***	.01
Class-Level Behavior		
Slope	–.01*	<.01
Intercept	.10**	.03

Random Effects	Variance Component	*df*	χ^2
Level 2			
Slope	.01	5,140	8,592.45***
Intercept	2.43	5,140	15,500.85***
Level 3			
Slope	<.01	1,580	2,297.48***
Intercept	.25	1,580	1,876.39***
Level 4			
Slope	<.01	740	990.82***
Intercept	.14	740	974.71***

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

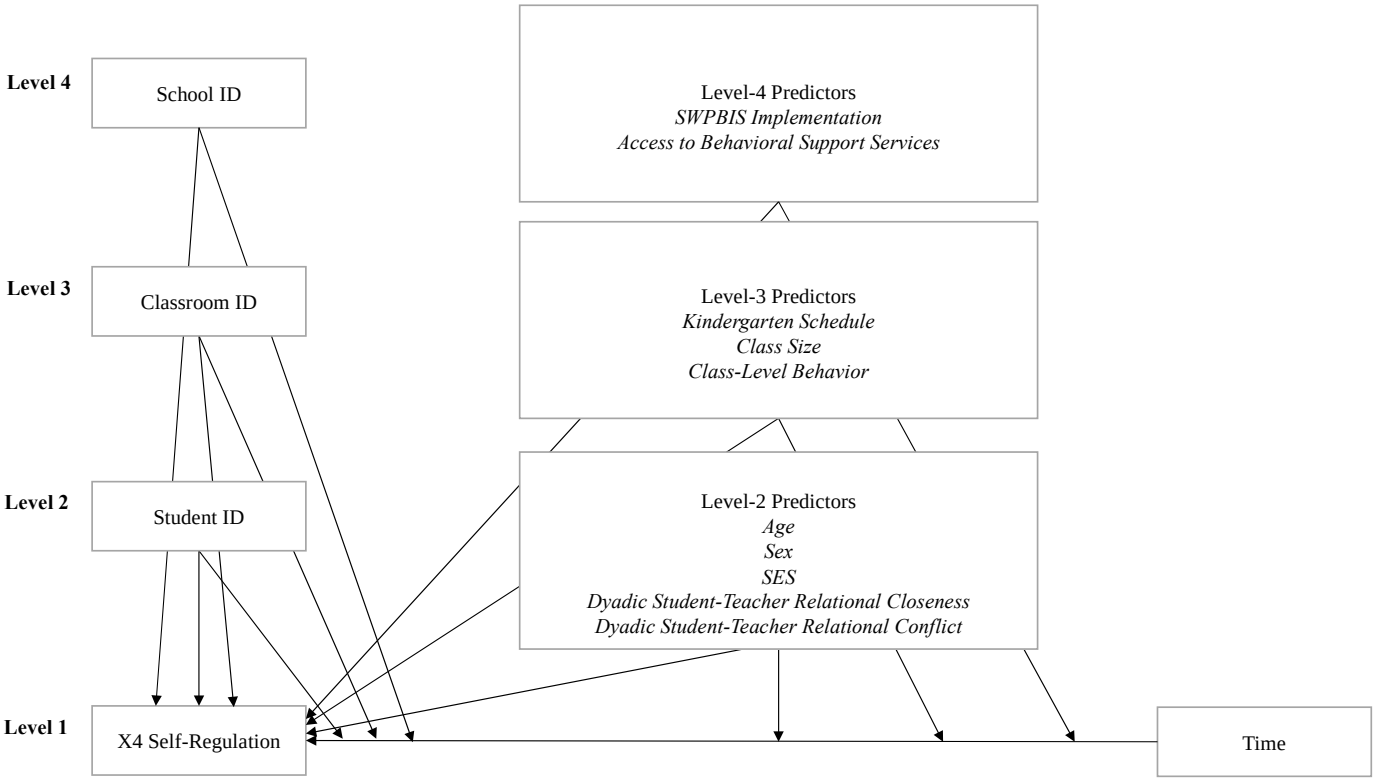

Figure 1. Multilevel model of child characteristics and kindergarten contextual factors on self-regulation growth and outcomes at first-grade Spring. The figure above depicts the tested model in a simplified fashion (e.g., by grouping variables within the same level and failing to represent within- and cross-level interactions). SES = socioeconomic status. SWPBIS = school-wide positive behavior interventions and supports implementation. X4 = first-grade Spring.

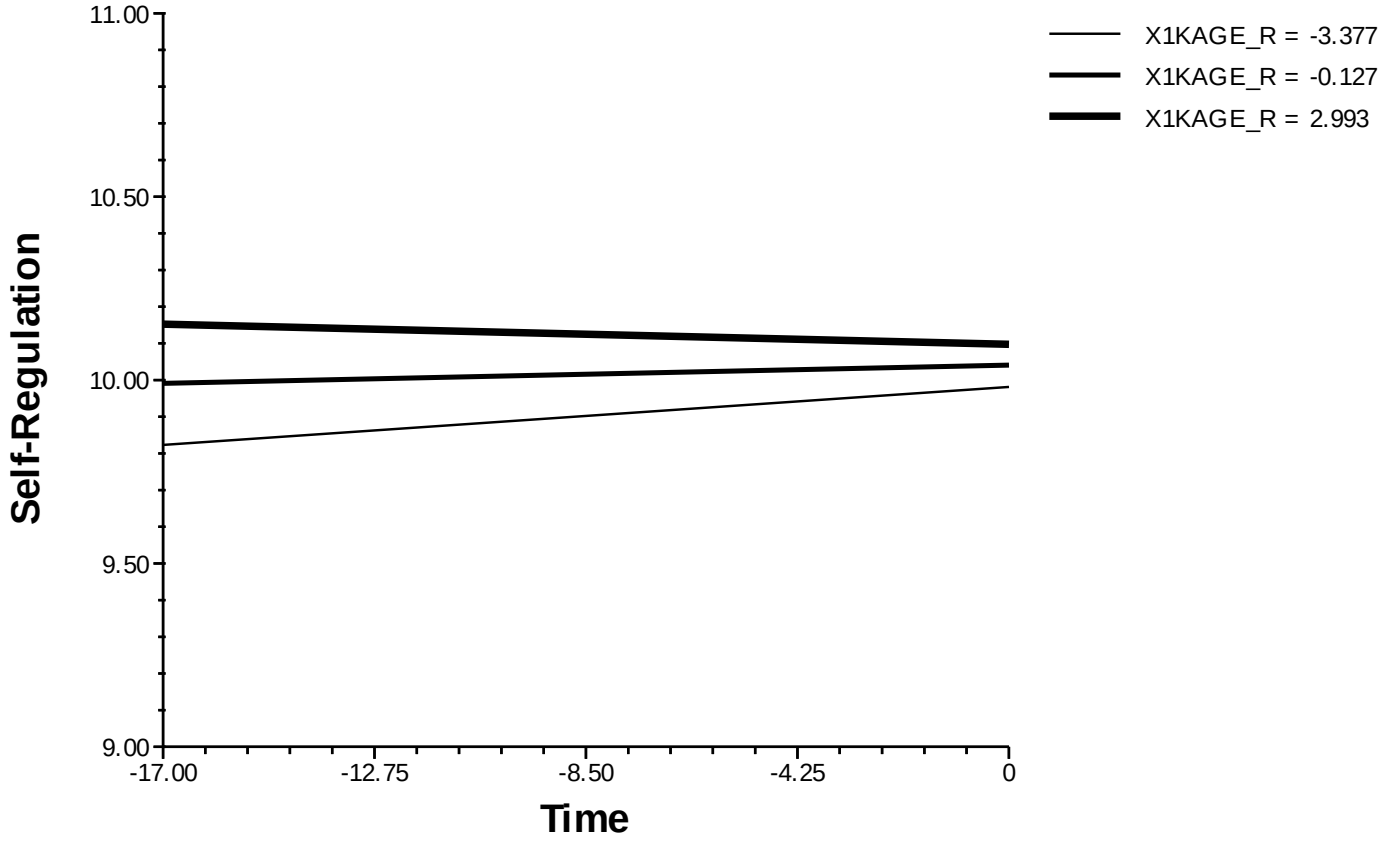

Figure 2. Teacher-rated self-regulation as a function of time and child age (25th, 50th, and 75th percentiles). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14.

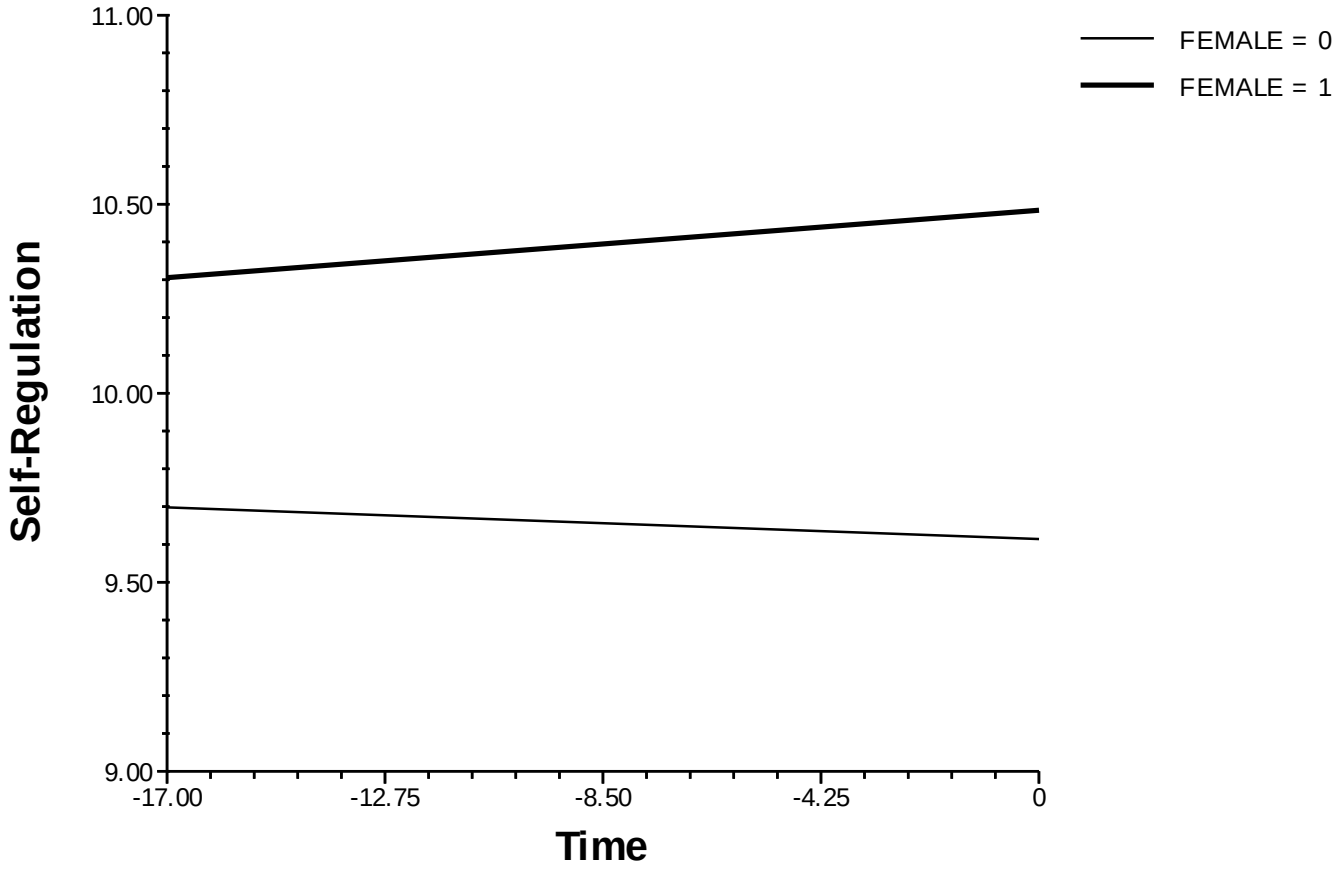

Figure 3. Teacher-rated self-regulation as a function of time and child sex (0 = male, 1 = female). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14.

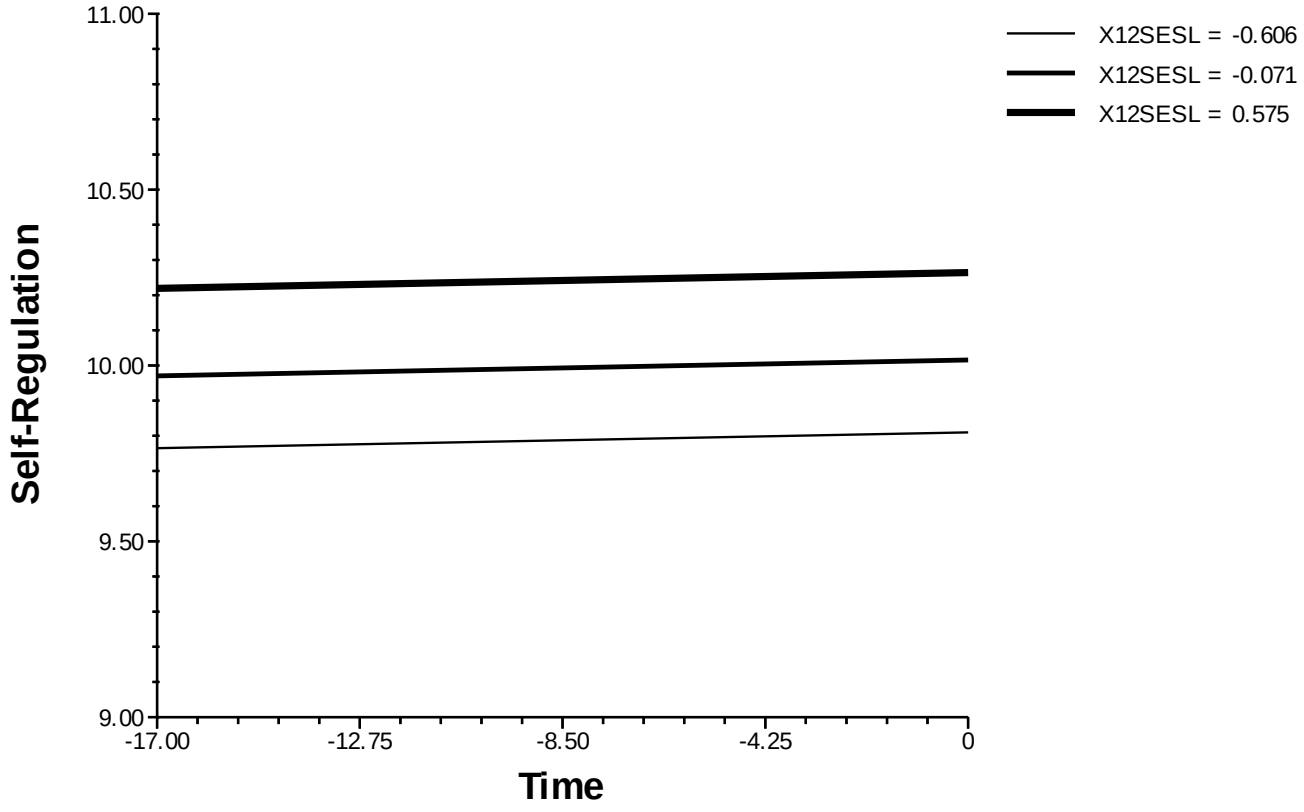

Figure 4. Teacher-rated self-regulation as a function of time and child socioeconomic status (25th, 50th, and 75th percentiles). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14.

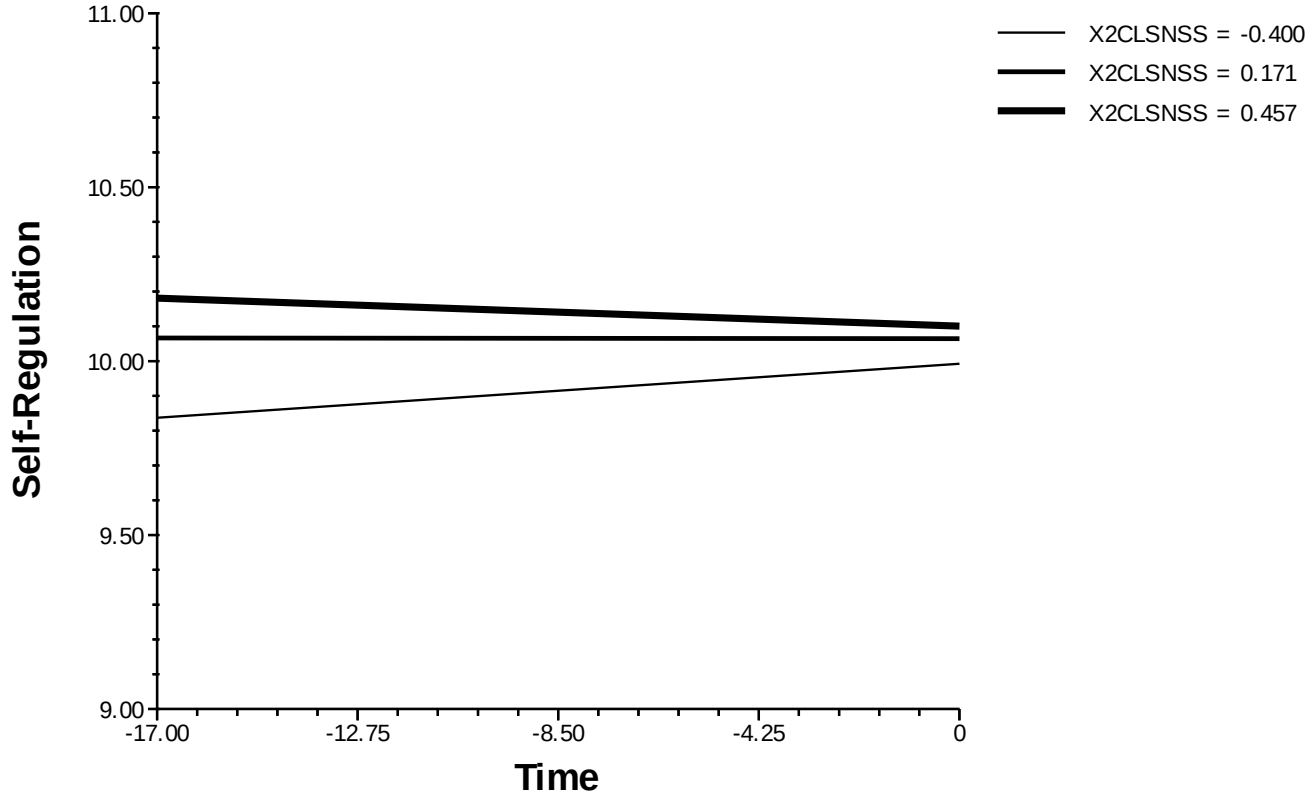

Figure 5. Teacher-rated self-regulation as a function of time and kindergarten teacher-reported student-teacher closeness (25th, 50th, and 75th percentiles). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14.

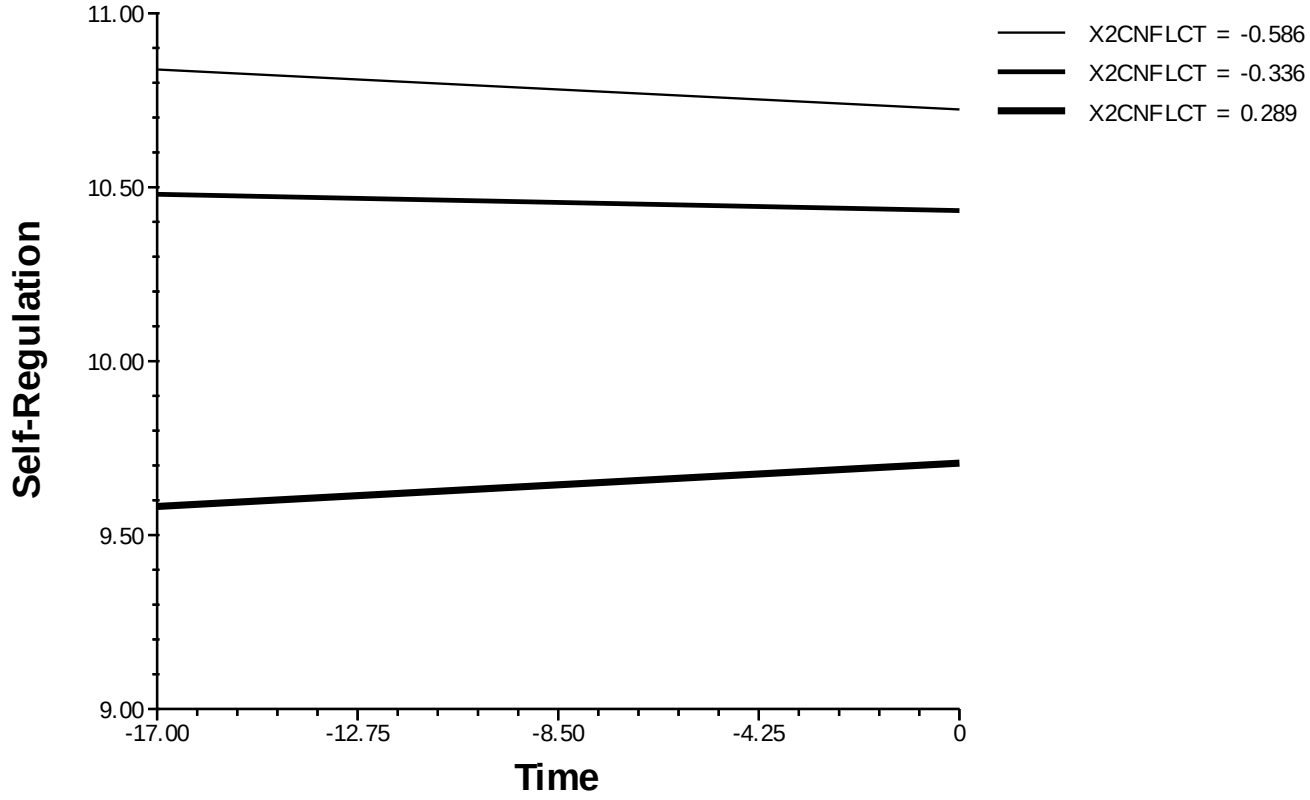

Figure 6. Teacher-rated self-regulation as a function of time and kindergarten teacher-reported student-teacher conflict (25th, 50th, and 75th percentiles). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14.

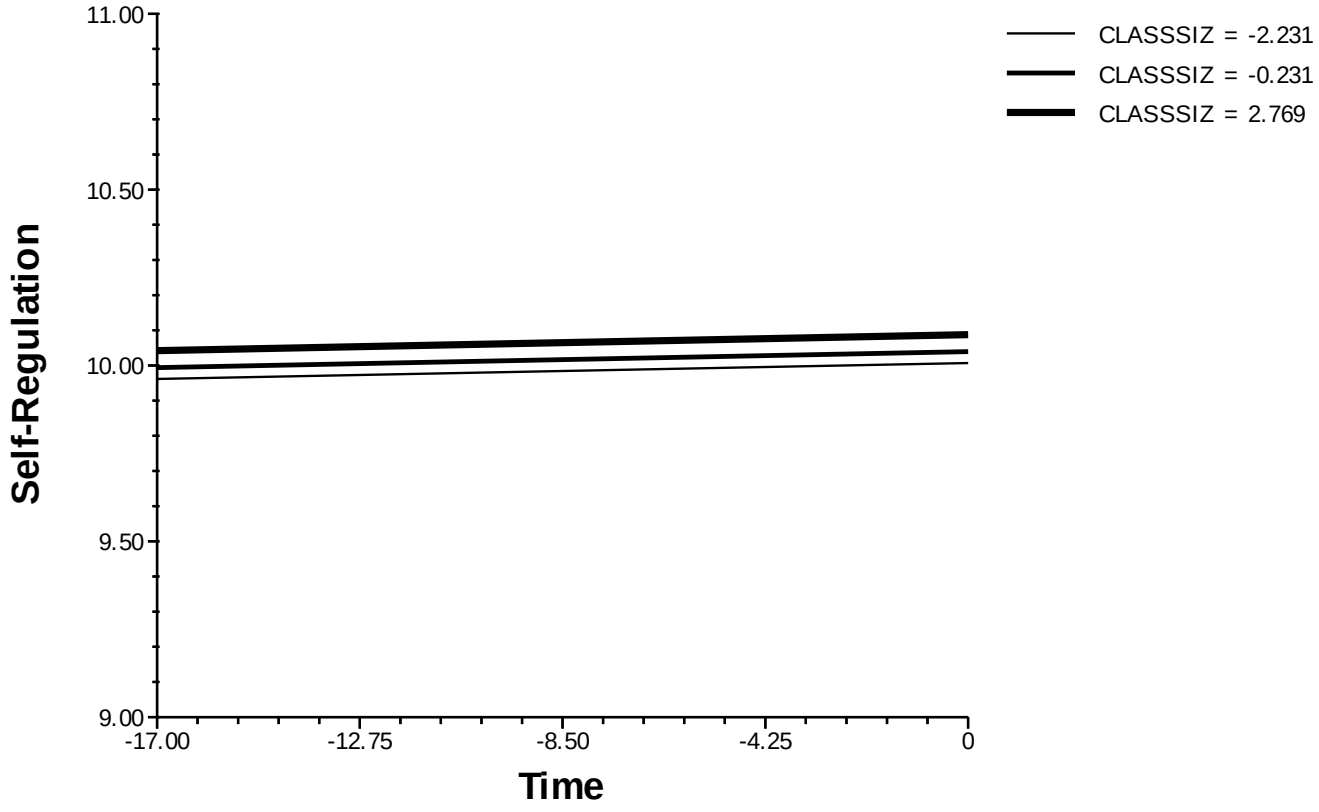

Figure 7. Teacher-rated self-regulation as a function of time and kindergarten class size (25th, 50th, and 75th percentiles). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14.

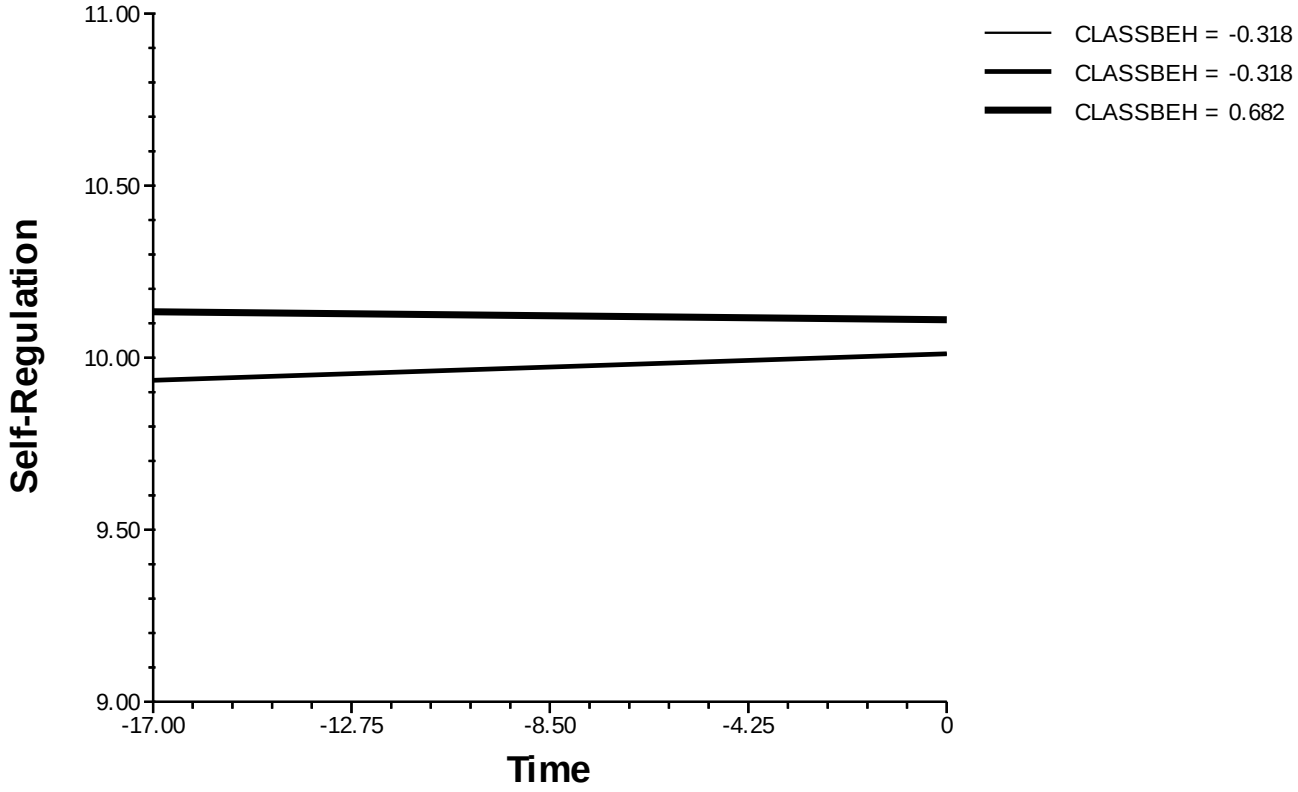

Figure 8. Teacher-rated self-regulation as a function of time and kindergarten teacher-reported class-level behavior (25th, 50th, and 75th percentiles). The time point –17 refers to measurement at kindergarten Fall and 0 refers to measurement at first-grade Spring. Self-regulation scores range from 2 to 14. Note that the 25th and 50th percentiles were the same values.

Updated September 29, 2017

CURRICULUM VITAE

Brittany N. (Kuder) Zakszeski

29 Medinah Drive ◆ Reading, PA 19607
brk213@lehigh.edu ◆ (610) 207-4912

EDUCATION

Ph.D. Candidate August 2013 – Present	**School Psychology** Concentration: School-Based Prevention Specialization: Self-Regulation APA-accredited, NASP-approved program Lehigh University; Bethlehem, PA Advisor: Robin L. Hojnoski, Ph.D.
M.Ed. August 2013 – December 2014	**Human Development** Lehigh University; Bethlehem, PA Advisor: Robin L. Hojnoski, Ph.D.
B.A. August 2009 – December 2012	**Psychology, Writing** Summa Cum Laude, Phi Beta Kappa Loyola University Maryland; Baltimore, MD Advisor: Rachel L. Grover, Ph.D.

CREDENTIALS

2016 – Present	Certified Educational Specialist, School Psychologist PK-12, PA (#8548524)
2014 – Present	Certified Positive Discipline Parent Educator (CPDPE)

HONORS & COMPETITIVE AWARDS

2017–2018	PEO Scholar Award ($15,000 for excellence in higher education)
2017	APA Student Travel Award ($300 to support travel to annual convention)
2012	Inductee, Phi Beta Kappa, National Honors Society for Liberal Arts and Sciences
2012	Highest Score on the Psychology Competence Exam, Loyola University Maryland Psychology Department
2011	Outstanding Sophomore Achievement in Writing, Loyola University Maryland Writing Department
2011	Inductee, Psi Chi, International Honors Society for Psychology

2011	Inductee, Pi Epsilon Pi, National Honors Society for Writing
2010	First Prize English 100-Level Essay, Loyola University Maryland English Department
2009–2012	Presidential Scholarship and Dean's List, Loyola University Maryland

UNIVERSITY INSTRUCTIONAL/SUPERVISORY EXPERIENCE

	Adjunct Instructor (Lehigh University)
Spring 2018	Educ451: Applied Principles of Cognitive Psychology
	Guest Lecturer (Lehigh University)
Fall 2017	TLT409: Instructional Design for K–12 Classrooms (Title: *An Introduction to Multi-Tiered Systems of Support)*
	Teaching Apprentice (Lehigh University)
Fall 2017	SchP423: Behavioral Assessment SchP433: Practicum in Behavioral Assessment SpEd/TLT409: K–12 Classroom Environment and Management
Spring 2017	Educ451: Applied Principles of Cognitive Psychology
	Peer Supervisor (Lehigh University)
Spring 2018	SchP442: Doctoral Practicum in School Psychology
Fall 2017	SchP442: Doctoral Practicum in School Psychology
	Writing Tutor (Loyola University Maryland)
Fall 2010–Fall 2012	Loyola Writing Center

SCHOOL/CLINICAL EXPERIENCE

August 2016 – Present

Doctoral Practicum Student
Centennial School of Lehigh University; Bethlehem, PA
Supervisors: Julie Fogt, Ed.D., NCSP & Christy Novak, Ph.D., LP
Designed, implemented, and evaluated academic, behavioral, and social skills interventions for primary and secondary students, including the use of academic and behavioral progress monitoring and functional behavior assessments. Provided solution-focused, cognitive-behavioral counseling to students with emotional disturbance and autism spectrum disorder. Consulted teachers regarding design and implementation of differentiated instructional and positive behavioral support strategies. Prepared and delivered professional development workshops for school personnel. Collaborated with school administrators in designing systems-level support and evaluation initiatives.

August 2015 – June 2016
Doctoral Practicum Student
Greenwich Elementary, Kutztown Elementary, Kutztown Area Middle School, Kutztown Area Senior High; Kutztown Area School District; Kutztown, PA
Supervisors: Dennis Seaman, Ed.D., NCSP & Christy Novak, Ph.D., LP
Completed psychoeducational evaluations with primary and secondary students to determine eligibility for special education. Consulted tier-2 reading/ELA intervention program administrators and developed, implemented, and evaluated tier-3 academic and behavioral interventions. Provided individual and group counseling services.

September 2014 – May 2015
Graduate Student Trainee, Practica in Behavioral Assessment & Assessment and Intervention in Educational Consultation
James Buchanan Elementary, Bethlehem Area School District; Bethlehem, PA
Supervisors: Robin Hojnoski, Ph.D. & Edward Shapiro, Ph.D.
Conducted comprehensive behavioral and curriculum-based assessments, implemented behavioral and academic interventions, and conducted behavioral and academic progress monitoring. Provided ongoing teacher and family consultation. Led a weekly kindergarten social skills group.

September 2014 – December 2014
Graduate Student Trainee, Practicum in Consultation Procedures
Donegan Elementary, Bethlehem Area School District; Bethlehem, PA
Supervisor: Patricia Manz, Ph.D.
Conducted a conjoint behavior consultation process with school personnel and family members to design, implement, and evaluate a behavioral intervention for a pre-kindergarten student.

October 2013 – December 2013
Graduate Student Trainee, Practicum in Applied Behavior Analysis
Fountain Hill Elementary, Bethlehem Area School District; Bethlehem, PA
Supervisor: Christine Cole, Ph.D.
Conducted functional behavior assessments and developed, implemented, and evaluated behavioral interventions for kindergarteners with disruptive classroom behaviors.

September 2012 – December 2012
Instructional Assistant
St. Elizabeth School; Baltimore, MD
Supervisor: Leslie Sunderhaus, M.Ed.
Provided individual and small-group instruction and assisted in implementing and evaluating behavior intervention plans for elementary and secondary students with autism spectrum disorders and intellectual disabilities.

August 2009 – December 2012
Clinical Assistant
Loyola Clinical Centers, Loyola University Maryland; Baltimore, MD
Supervisor: Mary Jo Coiro, Ph.D.
Assisted in the day-to-day management of a multidisciplinary clinic providing psychological and speech/language services. Developed and implemented social activities and behavioral interventions for children attending childcare during support groups for caregivers of children with autism spectrum disorders.

ADVANCED GRADUATE COURSEWORK

ADVANCED DOCTORAL SEMINARS/PRACTICA
Educ491: Structural Equation Modeling
Educ491: Hierarchical Linear Modeling
SchP436: Comprehensive School Health Programs
SchP436: Specialized Practicum in Clinical Supervision
SchP482: Practicum in University Teaching
SchP496: Autism Spectrum Disorders

BACB-APPROVED COURSE SEQUENCE IN APPLIED BEHAVIOR ANALYSIS
Educ461: Single-Subject Research Design
SchP/SpEd402: Applied Behavior Analysis
SpEd409: K–12 Classroom Environment and Management
SpEd410: Behavior Analysts: Ethics and Professional Conduct (Anticipated Spring 2018)
SpEd416: Autism Spectrum Disorders and Evidence-Based Practices (Anticipated Spring 2018)
SpEd432: Positive Behavior Support

PRIMARY RESEARCH INTERESTS

- Self-regulation of behavior, attention, and emotion in the context of risk and resilience for academic, social, behavioral, and emotional outcomes, particularly:
    - Examination of self-regulation's facilitation of academic learning and implication in academic assessment as well as role in the maintenance and functional impairments of developmental psychopathology;
    - Development of ecologically valid instruments for measuring self-regulation in schools;
    - Design and evaluation of positive behavior supports, including systems-level efforts, for promoting self-regulation development and enactment; and
    - Use of intervention-embedded external support fading and reinforcement schedule thinning procedures for scaffolding self-regulation
- Implementation science as applied to understanding schools' adoption and sustained use of evidence-based assessment and intervention practices for supporting learning, behavior, and resilience
- Promotion of equitable access to science, technology, engineering, and mathematics (STEM) learning opportunities and careers

CULMINATING RESEARCH PROJECTS

2017 **Doctoral Dissertation** (Lehigh University)
Early Elementary Trajectories of Classroom Behavior Self-Regulation: Prediction by Student Characteristics and Malleable Contextual Factors
Committee: Robin L. Hojnoski, Ph.D. (Chair), Bridget V. Dever, Ph.D., George J. DuPaul, Ph.D., & Megan M. McClelland, Ph.D.

Proposed May 2017, Defended September 2017

2014–2015 **Doctoral Qualifying Project** (Lehigh University)
Using Time Sampling to Measure Young Children's Classroom Engagement: Considerations for Interval Duration
Committee: Robin L. Hojnoski, Ph.D. (Chair), Christine L. Cole, Ph.D., & Brenna K. Wood, Ph.D., BCBA-D
Proposed September 2014, Approved May 2015, Published May 2016

2012 **Undergraduate Independent Project** (Loyola University Maryland)
Social Anxiety, Observed Performance, and Perceived Competencies in Adolescent Friendships
Advisor: Rachel L. Grover, Ph.D.
Proposed June 2012, Finalized November 2012, Published October 2013

RESEARCH EXPERIENCE

August 2017 – Present **Independent Researcher**
College of Education, Lehigh University; Bethlehem, PA
Conducted data analyses on original data as well as national longitudinal datasets to investigate questions related to the development of self-regulation and early mathematical skills and the use of positive behavior supports in schools (including evaluation of SWPBIS programming). Developed corresponding manuscripts and presentation materials.

August 2013 – August 2017 **Graduate Assistant**
College of Education, Lehigh University; Bethlehem, PA
Supervisor: Robin L. Hojnoski, Ph.D.
Contributed to the planning, implementation, evaluation, and dissemination of various research projects related to early childhood STEM learning and behavioral assessment. Coordinated early academic interventions and screenings for Bethlehem Area School District (BASD) pre-kindergarten programs. Assisted with BASD kindergarten screenings. Trained graduate students on academic progress monitoring and behavioral assessment systems. Coded videos and maintained a database for a behavioral observation generalizability study. Led early learning exhibits at a children's museum. Collaborated on a variety of presentations and manuscripts.

August 2015 – May 2017 **Graduate Assistant**
College of Education, Lehigh University; Bethlehem, PA
Supervisor: Lee Kern, Ph.D.
Conducted literature searches, coded articles, and analyzed data for projects examining positive behavior support trends, academic accommodations, transition programs, and services for students with emotional and behavioral disorders. Prepared project findings for dissemination.

May 2016 – July 2016 **Project Coordinator**
"Integrating Technology and Child Development: Geometric and Spatial Learning"
Mountaintop Program, Lehigh University; Bethlehem, PA
Supervisor: Robin L. Hojnoski, Ph.D.
Coordinated a project involving technology development and an intervention study comparing STEM learning gains between tablet and physical manipulative conditions. Developed and maintained relationships with research sites and organized data collection efforts. Trained and

supervised four undergraduate and two graduate research assistants.

May 2015 – March 2016 **Project Coordinator**
"Geometric Learning in Early Childhood"
Mountaintop Program, Lehigh University; Bethlehem, PA
Supervisor: Robin L. Hojnoski, Ph.D.
Coordinated a project featuring the research-driven development of an app promoting early STEM learning. Initiated research relationships with new childcare and preschool centers. Collected assessment data, managed research databases, conducted statistical analyses, and prepared manuscripts. Trained and supervised two undergraduate and three graduate research assistants.

January 2015 – May 2015 **Graduate Assistant**
"Lehigh University College of Education Online Education Taskforce"
College of Education, Lehigh University; Bethlehem, PA
Supervisor: Alex Wiseman, Ph.D.
Analyzed and synthesized results of interviews and surveys to write a report regarding a college's readiness and obstacles in offering high-quality online graduate education.

August 2014 – December 2014 **Graduate Assistant**
"The School Reform Debate"
College of Education, Lehigh University; Bethlehem, PA
Supervisor: Gary Sasso, Ph.D. (Dean)
Conducted literature searches and prepared presentation materials related to various perspectives on how to reform public education in the United States.

August 2011 – August 2013 **Undergraduate Research Assistant**
Department of Psychology, Loyola University Maryland; Baltimore, MD
Supervisors: Rachel Grover, Ph.D., & Theresa DiDonato, Ph.D.
Assisted in the coding of video recordings and surveys for projects examining social anxiety and relationships in adolescence. Initiated and executed an independent project, which resulted in a journal publication and conference presentation.

August 2009 – December 2012 **Clinical Undergraduate Research Assistant**
Loyola Clinical Centers, Loyola University Maryland; Baltimore, MD
Supervisor: Mary Jo Coiro, Ph.D.
Assisted in the preparation of research materials and in data entry and analysis for projects related to psychoeducational assessment methods and graduate student training procedures and outcomes.

PUBLICATIONS

REFEREED JOURNAL ARTICLES

Zakszeski, B. N., Ventresco, N. E., & Jaffe, A. R. (2017). Promoting resilience through trauma-focused practices: A critical review of school-based implementation. *School Mental Health, 9*, 310–321. doi:10.1007/s12310-017-9228-1

Repasky, P., Hojnoski, R. L., & **Zakszeski, B. N.** (2017). What does Daddy do? Father participation in early mathematical activities. *Perspectives in Early Childhood Psychology and Education, 2*(2), 47–85.

Clarke, S., **Zakszeski, B. N.,** & Kern, L. (2017). Trends in *JPBI* publications, 1999–2016. *Journal of Positive Behavior Interventions.* Advance online publication. doi:10.1177/1098300717722359

Zakszeski, B. N., & DuPaul, G. J. (2017). Reinforce, shape, expose, and fade: A review of treatments for selective mutism (2005-2015). *School Mental Health, 9*, 1–15. doi:10.1007/s12310-016-9198-8

Zakszeski, B. N., Hojnoski, R. L., & Wood, B. K. (2017). Considerations for time sampling interval durations in the measurement of young children's classroom engagement. *Topics in Early Childhood Special Education, 37*, 42–53. doi:10.1177/0271121416659054

Kuder, B. N., & Hojnoski, R. L. (2016). Under construction: Strategic changes in the block area to promote engagement and learning. *Young Exceptional Children.* Advance online publication. doi:10.1177/1096250616649224

Kuder, B. N., & Grover, R. L. (2014). Social anxiety, observed performance, and perceived social competencies in late-adolescent friendships. *Psi Chi Journal of Psychological Research, 19*, 10–19.

NON-REFEREED ARTICLES

Zakszeski, B. N., & Dubow, E. (in press). Gearing up for internship: Tips for future applicants. *Communiqué.*

MANUSCRIPTS IN DEVELOPMENT (UNDER REVIEW)

Hojnoski, R. L., Miller Young, R., **Zakszeski, B. N.**, & Chandler, L. (initial submission under review). *Math talk in blended preschool classrooms.*

Zakszeski, B. N., & Hojnoski, R. L. (initial submission under review). *Disentangling concurrent relations of numerosity comparison performance: The role of executive function*.

Zakszeski, B. N., & Hojnoski, R. L. (initial submission under review). *The approximate number system: Implications for early mathematical assessment?*

Hojnoski, R. L., Wood, B. K., Cawley, R., & **Zakszeski, B. N.** (first revision under review). *The effects of response cards on preschoolers' engagement during a mathematics activity*.

MANUSCRIPTS IN DEVELOPMENT (IN PREPARATION)

Zakszeski, B. N., Gallagher, E. K., & Dever, B. V. (in preparation). *Self-regulation, student-teacher relations, and school-level economic disadvantage: Differential susceptibility, treatment, or measurement?*

Zakszeski, B. N., & Hojnoski, R. L. (in preparation). *Another look at children's development of dynamic spatial transformation skills.*

Zakszeski, B. N., Hojnoski, R. L., & Mininger, K. (in preparation). *Assessing spatial ability: Existing instruments and their applicability for informing academic instruction and intervention.*

Zakszeski, B. N., Daffner, M., & Cleminshaw, C. (in preparation). *Are there evidence-based practices for childhood selective mutism? A critical evaluation of the treatment literature.*

Zakszeski, B. N., Flatley, K., Telesford, A., & Cole, C. L. (in preparation). *Behavioral self-management interventions in early education: A component- and meta-analytic review.*

PROFESSIONAL PRESENTATIONS

NATIONAL/INTERNATIONAL CONFERENCES

Zakszeski, B. N., & Fogt, J. B. (2018, March). *Beyond disciplinary data: An exploration of viable SWPBIS evaluation metrics.* Poster accepted for presentation at the 15th International Conference on Positive Behavior Support, San Diego, CA.

Zakszeski, B. N., & Hojnoski, R. L. (2018, March). *Self-regulation and autism spectrum disorder: An exploration of developmental trajectories.* Poster accepted for presentation at the 2018 Conference on Research Innovations in Early Intervention, San Diego, CA.

Zakszeski, B. N., Hojnoski, R. L., Dever, B. V., DuPaul, G. J., & McClelland, M. M. (2018, February). *Examining viable contextual targets for supporting students' self-regulation development.* Paper accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

Zakszeski, B. N., Dever, B. V., & Gallagher, E. K. (2018, February). *Student-teacher relationships and self-regulation development: Findings of differential susceptibility.* Poster accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

Ventresco, N. V., **Zakszeski, B. N.,** & Jaffe, A. R. (2018, February). *From why to how: Recommendations for school-based, trauma-focused practice implementation.* Paper accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

Ventresco, N. V., **Zakszeski, B. N.,** Hojnoski, R. L., Kline, D., Mininger, K., Van Voorhis, L., & Spear, M. (2018, February). *Spatial and Geometric Adventures: Deliberate design of an educational app.* Paper accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

Van Voorhis, L., Mininger, K., **Zakszeski, B. N.,** Ventresco, N., Hojnoski, R. L., & Kline, D. (2018, February). *Searching for the education in educational apps: A corpus analysis.* Poster accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

Hojnoski, R. L., Briesch, A. M., Wood, B. K., & **Zakszeski, B. N.** (2018, February). *Generalizability of behavior observations in early education.* Poster accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

NASP Graduate Student Committee. (2018, February). *Increasing diversity recruitment in school psychology: Emerging strategies and directions.* Practitioner conversation session accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

NASP Graduate Student Committee. (2018, February). *The many faces of school psychologists: Diverse roles and professions.* Practitioner conversation session accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

NASP Graduate Student Committee. (2018, February). *Networking bootcamp for graduate students: How to get started.* Poster accepted for presentation at the National Association of School Psychologists annual convention, Chicago, IL.

Zakszeski, B. N., & DuPaul, D. G. (2017, August). *Interventions for children with selective mutism: A critical review of the literature (2005–2015).* Poster presented at the 125th annual convention of the

American Psychological Association, Washington, D.C.

Zakszeski, B. N., & Hojnoski, R. L. (2017, August). *Pathways to early academic competence: Relations among cognitive abilities in early childhood.* Poster presented at the 125th annual convention of the American Psychological Association, Washington, D.C.

Hojnoski, R. L., & **Zakszeski, B. N.** (2017, August). *Assessing spatial ability: Toward the development of a new tool.* Poster presented at the 125th annual convention of the American Psychological Association, Washington, D.C.

Zakszeski, B. N., Flatley, K., Cole, C. L., & Telesford, A. (2017, March). *Self-management of behavior in the early childhood classroom: Component- and meta-analytic findings.* Poster presented at the 14th International Conference on Positive Behavior Support, Denver, CO.

Clarke, S., **Zakszeski, B. N.,** & Kern, L. (2017, March). *Data-based intervention trends in JPBI publications 1999–2016*. Poster presented at the 14th International Conference on Positive Behavior Support, Denver, CO.

Zakszeski, B. N., Flatley, K., Cole, C. L., & Telesford, A. (2017, February). *Self-management in early childhood: Intervention components, outcomes, and trends.* Paper presented at the National Association of School Psychologists annual convention, San Antonio, TX.

Zakszeski, B. N., Hojnoski, R. L., & Wood, B. K. (2017, February). *Measurement error in the partial interval recording of interfering behaviors.* Poster presented at the National Association of School Psychologists annual convention, San Antonio, TX.

Hojnoski, R. L., & **Zakszeski, B. N.** (2017, February). *Exploring the approximate number system: Implications for early mathematical assessment.* Poster presented at the National Association of School Psychologists annual convention, San Antonio, TX.

Zakszeski, B. N., Hojnoski, R. L., Spear, M., & Ventresco, N. E. (2016, October). *Battle of the blocks: Virtual versus physical block-building in the promotion of young children's spatial and geometric skills.* Poster and demonstration presented at the Society for Research in Child Development's special topic meeting, Technology and Media in Children's Development, Irvine, CA.

Zakszeski, B. N., Hojnoski, R. L., Spear, M., & Ventresco, N. E. (2016, October). *Children as virtual block-builders: Design, development, and usability of a 3-D block-building app.* In *Early Cognition*. Paper and demonstration presented in an unchaired symposium at the Society for Research in Child Development's special topic meeting, Technology and Media in Children's Development, Irvine, CA.

Kern, L., **Kuder, B.,** Lane, K., Dunlap, G., Horner, R., Jolivette, K., Kincaid, D., Clarke, S., Knoster, T., Koegel, R., & Sugai, G. (2016, March). *Discussion of key issues in the future direction of PBS and JPBI.* Invited panel discussion at the 13th International Conference on Positive Behavior Support, San Francisco, CA.

Hojnoski, R. L., Dennis, M. S., **Kuder, B. N.,** & Polignano, J. (2016, February). *Early intervention in mathematics: In search of a research design.* Poster presented at the Conference on Research Initiatives in Early Intervention biennial meeting, San Diego, CA.

Kuder, B. N., Hollingsworth, K., Fanizza, A., Lynch, M., & Shapiro, E. S. (2016, February). *Combining short- and long-term progress monitoring in assessing interventions.* Mini-skills workshop presented at the National Association of School Psychologists annual convention, New Orleans, LA.

Kuder, B. N., Hojnoski, R. L., & Wood, B. K. (2016, February). *Time sampling interval durations for measuring young children's classroom engagement.* Poster presented at the National Association of School Psychologists annual convention, New Orleans, LA.

Kuder, B. N., Cawley, R. A., Hojnoski, R. L., & Wood, B. K. (2015, February). *Using response cards to promote preschoolers' engagement during mathematics instruction.* Poster presented at the National Association of School Psychologists annual convention, Orlando, FL.

Hojnoski, R. L., & **Kuder, B. N.** (2015, February). *Using five frames to promote number sense.* In S. M. Sheridan (Chair), *At the intersection: School psychology and early education and intervention.* Symposium presented at the National Association of School Psychologists annual convention, Orlando, FL.

Grover, R. L., **Kuder, B. N.,** & Victoratos, K. C. (2014, March). *Social anxiety, observed performance, and perceived social competencies in late-adolescent friendships.* Poster presented at the Society for Research on Adolescence biennial meeting, Austin, TX.

STATE/REGIONAL CONFERENCES

Zakszeski, B. N., & Gallagher, E. K. (2017, October). *School psychologists' role in promoting student-teacher relationships.* Workshop accepted for presentation at the Association of School Psychologists of Pennsylvania Fall conference, State College, PA.

INVITED PRESENTATIONS AT OTHER EVENTS

Zakszeski, B. N. (2017, March). *From the BOSS to the BOSS-EE: Detours from a blazed trail in assessing the academic environment.* In B. V. Dever (Chair), *Academic assessment.* Symposium presented at the event, "Academic Assessment and Intervention, Multi-Tiered Systems of Support, and Pediatric School Psychology: Celebrating Ed Shapiro – A Grand Slam Every Time," Lehigh University, Bethlehem, PA.

TRAININGS

Belk, G., & **Zakszeski, B. N.** (2017, December). *Universal and targeted strategies for supporting mathematics computation.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, November). *Universal and targeted strategies for supporting reading fluency, vocabulary, and comprehension.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, November). *Behavior management and relationships.* In-service training presented to America Reads/America Counts tutors at Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, October). *Behavior management and relationships.* In-service training presented to America Reads/America Counts tutors at Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, October). *Fundamentals of reading.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, March). *Behavioral momentum and instructional sequencing in mathematics interventions.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, March). *Fundamentals of mathematics.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Belk, G., & **Zakszeski, B. N.** (2017, February). *Designing organizational supports for the classroom.* Staff

development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2017, February). *Designing self-management interventions for the classroom.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2016, November). *Collaborative strategic reading.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

Zakszeski, B. N., & Belk, G. (2016, October). *Fundamentals of reading.* Staff development training presented at Centennial School of Lehigh University, Bethlehem, PA.

GRANT WRITING & COORDINATION EXPERIENCE

August 2016 – August 2017
Building Technology to Understand and Support STEM Skills in Young Children
Source: Lehigh University Collaborative Research Opportunity Grant
Role: Project Coordinator
Principal Investigators: Robin L. Hojnoski, Ph.D., & Michael Spear, Ph.D.
Status: Funded ($50,212)

May 2016 – October 2016
Integrating Technology and Child Development: Geometric and Spatial Learning
Source: Lehigh University Mountaintop Program
Role: Grant Writer, Project Coordinator
Principal Investigators: Robin L. Hojnoski, Ph.D., & Michael Spear, Ph.D.
Status: Funded ($31,500)

May 2015 – October 2015
Geometric Learning in Early Childhood
Source: Lehigh University Mountaintop Program
Role: Grant Writer, Project Coordinator
Principal Investigator: Robin L. Hojnoski, Ph.D.
Status: Funded ($19,230)

SERVICE

FIELD

July 2017 – Present
Member & Student Support Leader/Student Leader Coordinator,
Graduate Student Committee, National Association of School Psychologists

2017 – Present
Proposal Reviewer
American Psychological Association Annual Convention (2017)
National Association of School Psychologists Annual Convention (2017)

2014 – Present
Ad-Hoc Student Reviewer
Assessment for Effective Intervention (2014, 2016)
Early Education and Development (2016)
School Psychology Quarterly (2014)
School Psychology Review (2015, 2016, 2017)
Topics in Early Childhood Special Education (2015, 2017)

UNIVERSITY/COLLEGE/DEPARTMENT

June 2017 – Present Invited Student Member, Search Committee for Tenure-Track School Psychology Faculty Member, Lehigh University

PROFESSIONAL AFFILIATIONS

American Educational Research Association (AERA)
American Psychological Association (APA), Division 7 (Developmental Psychology)
American Psychological Association (APA), Division 16 (School Psychology)
Association for Positive Behavior Support (APBS)
Association of School Psychologists of Pennsylvania (ASPP)
National Association of School Psychologists (NASP)
Society for Research in Child Development (SRCD)

MEDIA ENGAGEMENT

Hochbein, K. (2016, September). "Shaping geometric knowledge." *Theory to Practice.*

Hochbein, K. (2016, June). "Building knowledge." *Lehigh Bulletin*.

Plombon, S. (2015, October). "Educational app facilitates geometry concepts for preschoolers." *P.C. Rossin College of Engineering and Applied Science News.*

Hochbein, K. (2015, August). "Building geometric knowledge." *Lehigh University News*.