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Judith L. Meece, Jacquelynne S. Eccles

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Bridget K. Hamre, Robert C. Pianta

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**HANDBOOK OF
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AND HUMAN
DEVELOPMENT**



EDITED BY

JUDITH L. MEECE

JACQUELYNNE S. ECCLES

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Classroom Environments and Developmental Processes

Conceptualization and Measurement

BRIDGET K. HAMRE AND ROBERT C. PIANTA

Children on average spend at least 15,000 hours in classrooms from the age of 4 or 5 until they leave high school. Indeed, there are few places in which they spend more time. Within classrooms, children and adolescents are exposed to critical developmental experiences—they learn to read, write, and think critically, they make friends and have to face the inevitable issues with peer relationships, and they are challenged to become productive, independent members of a larger society. Driven in part by the rise of contextualism in developmental science (Cicchetti & Aber, 1998; Lerner, 1998), several seminal programs of research have illuminated the powerful effect classroom experiences can have on children's development (e.g., Alexander & Entwisle, 1988; Ladd & Burgess, 1999; Morrison & Connor, 2002; National Institute of Child Health and Human Development, Early Childcare Research Network [NICHD, ECCRN], 2002, 2003a; Roeser, Eccles, & Sameroff, 2000; Skinner & Belmont, 1993). Notwithstanding the contributions of these research programs, such examples are exceptions in developmental science, which has drawn much more intensively on the study of home environments and their effects to develop theories of how social settings influence development (Eccles & Roeser, 2005).

Recently, however, there has been a significant increase in research activity devoted to examining the nature of students' experiences in classrooms and the ways in which these experiences uniquely contribute to social, cognitive, and academic development. This increase in research has been driven by several factors. First, educational accountability reform in general, and the No Child Left Behind Act (NCLB) in particular, have placed individual schools and teachers in the spotlight by requiring evidence of their ability to produce student achievement. No Child Left Behind has required policymakers and school administrators to produce evidence that classroom experiences are causes of student outcomes. Second, the well-documented achievement gaps related to culture, race, and income (National Center for Education Statistics, 2003; West, Denton, &

Germino-Hausken, 2000), have drawn attention to ways schools need to modify curriculum, school culture, and staffing in attempts to close this gap. Finally, new investments of funds, and even the creation of new research societies, are aimed at producing evidence of the effectiveness of education interventions. One could plausibly argue that the United States is paying more attention to what happens in classrooms than ever before.

The increased interest in the classroom has led to the development of new theoretical models and methodologies for classroom-based research and has emphasized the importance of integrating developmental research with educational science. Pianta (2006) argues that the study of development in classrooms offers as much for developmental theory as it does for educational practice. In an effort to spur continued interest in this intersection, this chapter: (1) provides a rationale for studying classrooms as a unique developmental context; (2) describes a conceptual framework for the study of classrooms that organizes and integrates findings across developmental and educational sciences; (3) summarizes issues in the measurement of classroom environments; and (4) discusses implications for future research.

Classrooms as a Unique Developmental Context

Schools are multilevel organizations—districts, school buildings, grade levels, classrooms, social groups are all identifiable levels that could be a legitimate focus for understanding the connection between schooling and development. But classrooms, rather than other levels of schooling, are the unit of focus within this chapter.

Why Focus on Classrooms? First, evidence from developmental science strongly indicates that effects of social settings on children's development are driven by proximal processes (Bronfenbrenner & Morris, 1998), the interactions that children have on a daily basis with adults, peers,

organizational structures, and materials. When examining schooling effects, children's experiences in classrooms constitute the majority of their day and thus constitute the majority of school-based proximal processes. Furthermore, it is classroom level experiences that appear to be most closely associated with student outcomes (Nye, Konstantopoulos, & Hedges, 2004). School-level effects, such as school climate and culture, are important aspects of students' experiences. However, these effects are more distal from students' developmental progress and are largely mediated through or moderated by classroom processes (Hamre & Pianta, 2007).

Another reason to consider classrooms, discussed by Pianta (2006), is the recognition that classroom interactions are not simply applications of practices that are only of interest to educators, but rather reflect processes that should be of as much interest to developmental scientists as are interactions children have with parents and peers, if only for the reason that they are intended to produce developmental change. Researchers who have applied developmental theories to classrooms have discovered that classrooms offer an incredibly rich context in which to study basic developmental processes. Unlike in families, in which only a few children are exposed to a given familial context, in classrooms there are many children who are exposed to that environment over time. This allows for modeling aspects of bio-ecological theory (Bronfenbrenner & Morris, 1998), such as the potential for differential responsiveness to different features of a social setting. For example, work by Connor, Morrison, and colleagues (Connor, 2005; Connor, Morrison, & Petrella, 2004; Morrison & Connor, 2002) provides consistent evidence that children coming into classrooms with varying levels of reading ability benefit from very different instructional practices. Their studies have shown that children at risk of reading difficulties benefit from high levels of teacher-directed explicit language instruction but that this type of instruction makes no difference in decoding skills for children with already high skills on this dimension upon school entry. Highly skilled children, in contrast, make the strongest gains in classrooms with more child-led literacy-related activities.

A final reason for a focus on classrooms is that, with increasing focus on the design, implementation, and evaluation of prevention and intervention programs through experimental contrasts, classrooms are very often a location in which these programs are implemented (Greenberg, Domitrovich, & Bumbarger, 2001). It is our contention that such programs will not be entirely successful nor will they be theoretically informative without the full recognition, conceptually and methodologically, that everyday classroom interactions are the medium through which such programs will ultimately produce change. There is consistent evidence that the effects of school-based interventions rise and fall with how they are implemented within schools (Greenberg et al., 2001; Rones & Hoagwood, 2000). Due in part to early failures of some school-based intervention approaches, prevention science has increasingly focused on

ways in which to conceptualize and measure classroom level implementation variables as critical to the success of any program of research in this area (Hamre et al., in press; Han & Weiss, 2005; Kam, Greenberg, & Walls, 2003; Valente, Unger, Ritt-Olson, Cen, & Johnson, 2006). These efforts are critical to the successful adaptation of developmental theory into educational interventions.

Current Developmental Theory and Educational Processes—Confluence and Deviations As more developmental scientists move to study classrooms, there is a need for conceptual models that integrate decades of research on children's development in home and peer contexts, with educational research. There are two basic approaches to this task, one which highlights the commonalities between developmental processes elucidated through the study of families and peers and their classroom equivalents and one which seeks to understand classrooms as a unique developmental context. Both approaches have made important contributions to our understanding of the role of classroom environments in children's development.

The first approach views classrooms primarily as extensions of home environments. Thus, developmental processes known to be important causal agents in home settings, such as parent-child interactions, are transferred to the classroom environment. This view draws from ideas that there are underlying mechanisms driving development (Pianta, 2006). Much of the developmentally informed research conducted to date on classroom effects has taken this approach. For example, just as maternal sensitivity is a key mechanism of young children's development (Ijzendoorn & Bakermans-Kranenburg, 2004; NICHD, ECCRN, 2005), teacher sensitivity has been shown to uniquely contribute to gains in students' performance (Rimm-Kaufman, Early, & Cox, 2002). Effective classroom teachers have also been shown to share many of the same characteristics of Baumrind's (1991) description of effective parents (Wentzel, 2002). Our own work (e.g., Hamre & Pianta, 2001; Pianta, 1999) and the work of others (Birch & Ladd, 1996, 1998; Silver, Measelle, Essex, & Armstrong, 2005; Van Ijzendoorn, Sagi, & Lambermon, 1992; Wentzel, chapter 6 this volume) has similarly focused attention on the ways student-teacher relationships mirror child-parent relationships, both in conceptualization and effects.

An approach assuming some underlying mechanism or contextual isomorphism as accounting for classroom effects and experiences is, however, insufficient to explain the entirety of classroom effects. The approach fails to recognize that classrooms and families are often oriented around very different goals and thus similar processes may function in different ways across home and school environments. For example, because teachers and administrators typically view their primary goal as producing academic gains rather than social, personal, or moral development, strategies for managing students' behavior take on different meanings from the way behavior is managed within families. In classrooms, behavioral control serves primarily as a tool to help

get as much instruction accomplished as possible. In contrast, families may use these practices with much broader goals in mind, such as helping children develop important self-regulatory skills. The consequences for children who challenge behavioral regulation or control strategies are also different. Teachers have options such as sending the child out of the classroom or, ultimately, out of the school, that are not available to or desirable for most families. Thus, although the broad concept of behavioral control may be similar across schools and families, the specific interactions, goals, and outcomes associated with this concept are likely to differ. The larger point here is that interactions in classrooms are likely to serve goals that are different from interaction systems in families even when they both draw upon phenotypically similar behavioral domains.

Beyond different goals, the classroom context itself and the interactions that occur within it can be very different from those within families. As just one example, Hughes, Cavell, and Wilson (2001) suggest that classrooms are a unique context in the development of peer relationships, in part, because teacher–student interactions serve as a potent and frequent source of information about other students that can figure prominently in children’s preferences and beliefs about others. Another set of differences between classrooms and families involves constraints on adult–child interaction. Unlike in families, physical contact and comforting is not a feature of teacher–student interactions in third grade or beyond, and although students often voice the importance of supportive relationships with teachers (Resnick et al., 1997), teachers themselves receive very little in the way of training or knowledge about forming such relationships. Another feature that differentiates classrooms and home settings in relation to developmental processes is the absence of genetic mediation in the interactions between people: in families the qualities of a parent’s behavior and a child’s response are linked in part by shared genetic substrates; in classrooms the common genetic mechanisms are not present and so the extent of a teacher’s interactions having an influence on child outcomes is somewhat different in terms of the nature of the mechanism explaining these effects.

A final distinction between home and classroom environments relates to the ways in which these environments change over time. Family environments are much more stable than classrooms. Within the United States, children typically change classrooms, teachers, and peer groups each year and go through major shifts as they move from preschool to elementary school to middle school and high school (Anderman & Anderman, 1999; Eccles & Midgley, 1989; La Paro et al., 2009; Midgley, 2002; Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991). This lack of continuity offers both a challenge and opportunity to developmental scientists and can be an important entry point for links between developmental science and educational practices; Eccles’s work on middle school transition is one example (Eccles, 2004). Another opportunity is the case of “looping,” a practice involving students staying with the same peers and teacher for more than one year, rather than moving

from year to year. There is almost no empirical research on looping (see Hampton, Mumford, & Bond, 1997 for an exception), but it offers a unique opportunity to examine the consequences of an educational practice with significant implications for understanding the role of relationships, both with peers and with teachers, in children’s development. Thus again, the changing nature of classroom contexts offers opportunities for developmentally informed research that exploits the natural variation present in these changes (e.g., looping or not; tracked classes and nontracked classes; having fewer or more teachers in a given grade).

In each of the examples cited above, there is a need to move beyond theories and measures developed in home contexts to ensure that the developmental contexts and processes most salient to the classroom environment are adequately captured. It is these adaptations and integrations of developmental theory and educational research that are a focus of this chapter. The examples cited above offer a glimpse of what could be learned through a more systematic exploitation and exploration of this “seam” between home and classroom and the processes that operate to promote children’s gains in and across both settings. The extent to which further research contributes to understanding development in educational settings is in part predicated on further specification of the nature and dimensions of classroom processes as unique in their own right and not a derivative of the literature on families. The next section provides a conceptual framework for understanding classroom environments that integrates years of research from developmental scientists and educational researchers.

Defining and Understanding Classroom Environments

Educational and developmental researchers have often approached the study of classrooms in fairly distinct ways, with educational research much more focused on the instructional context and developmental research concentrating on the social dynamics of classrooms. Although there are conceptual models that stress the relative salience of a variety of different features of classrooms (e.g., Eccles & Roeser, 1999), they tend to be the exception. Consistent with developmental theories emphasizing the role of proximal process on development (Bronfenbrenner & Morris, 1998), this chapter takes the view that the most critical ingredients of any classroom environment are the interactions among adults and students. This view of classroom environments excludes a focus on some aspects of classrooms that have been the focus of research, such as the availability of furnishings, materials, and curricula. However, it also provides a broad, holistic view of the classroom environment that includes all types of interactions—those that are social, organizational, and instructional in nature. As such, this view of classroom environments is inclusive of research focused on more discrete aspects of classrooms such as quality or effective teaching, learning environments, and student–teacher and peer relationships.

To help organize the diverse literatures that inform classroom environments, we proposed a system for organizing the wide range of interactions in classrooms, referred to as the Classroom Assessment Scoring System (CLASS) Framework (Hamre & Pianta, 2007; Pianta, Hamre, Spekman, Mintz, & La Paro, 2006; Pianta, La Paro, & Hamre, 2007). The CLASS Framework is a theoretically driven and empirically supported conceptualization of classroom interactions organized into three major domains: Emotional Supports, Classroom Organization, and Instructional Supports. Within each domain are a set of more specific dimensions of classroom interactions that are presumed to be important to students' academic or social development (see Figure 3.1). The CLASS Framework is consistent with several other descriptions of classroom environments or quality teaching put forth in the educational and developmental literatures (e.g., Brophy, 1999; Brophy & Good, 1986; Eccles & Roeser, 1999; Gage, 1978; Pressley et al., 2003; Soar & Soar, 1978).

The CLASS Framework draws heavily from theoretical and empirical work on classrooms advanced within educational literatures, but it also relies on a developmentally informed analysis of the features of classroom settings salient for producing developmental change (see Pianta & Allen, 2008). There are several additional conceptual and methodological distinctions between the CLASS Framework and other frameworks for studying classrooms. One distinction is that although most educational research has relied on studies of discrete behavioral indicators of putatively effective teaching (e.g., time allocations, presence of advanced organizers, number of instructional cues, etc.), the model proposed by Hamre and Pianta (2007) describes a *latent* structure for organizing teachers'

behaviors. Importantly, this three-domain latent structure (emotional supports, organizational supports, instructional supports) emanates from an analysis of classroom settings predicated on identifying proximal processes that developmental theory would suggest to be important for growth in academic and social outcomes (Pianta, 2006). This identification of a latent structure for developmentally salient proximal processes in classrooms is similar to the model proposed by Eccles and Roeser (1999); however, the CLASS Framework extends this earlier work by including a more thorough description of the developmental processes underlying each broad domain. For example, as shown in Figure 3.1, the latent domain of Emotional Supports includes several key dimensions: Classroom Climate, Teacher Sensitivity, and Regard for Student Perspective that have empirical support for effects related to child outcomes. Within each dimension, specific behaviors and interactions are also identified and provide indications of classrooms that may be high or low on the dimension (see Table 3.1). Classroom Climate includes observable behavioral indicators such as the frequency and quality of teacher affective communications with students (smiles, positive verbal feedback) as well as the degree to which students appear to enjoy spending time with one another. This detailed conceptualization of levels of classroom environments, moving from broad theoretically based domains to very specific behavioral indicators, facilitates the integration of a wide range of educational and developmental literatures.

Another key distinction between the CLASS Framework and others is recent empirical support for this organization of classroom processes derived from observational studies of actual classrooms (Hamre, Pianta, Mashburn, &

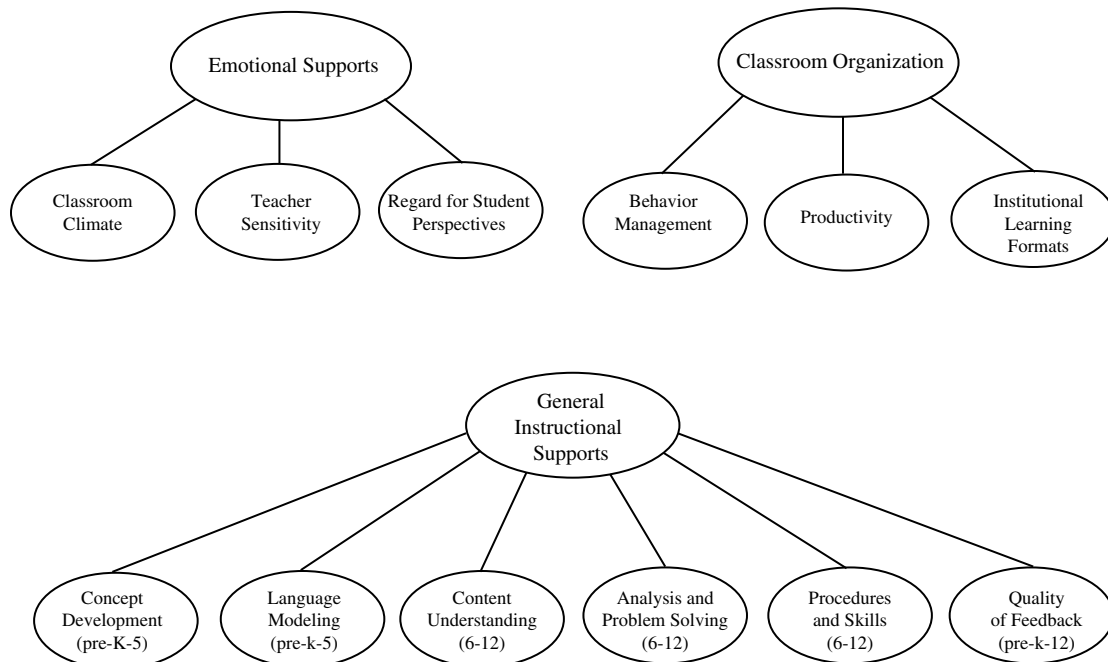


Figure 3.1 Classroom Assessment Scoring System (CLASS) Framework.

TABLE 3.1
Description of CLASS Framework Dimensions

Dimension	Description
Emotional Support	
Classroom climate	Reflects the overall emotional tone of the classroom and the connection between teachers and students. Considers the warmth and respect displayed in teachers and students interactions with one another as well as the degree to which they display enjoyment and enthusiasm during learning activities.
Teacher sensitivity	Encompasses teachers' responsiveness to students' needs and awareness of students' level of academic and emotional functioning. The highly sensitive teacher helps students see adults as a resource and creates an environment in which students feel safe and free to explore and learn.
Regard for student perspectives	The degree to which the teacher's interactions with students and classroom activities place an emphasis on students' interests, motivations, and points of view, rather than being very teacher driven. This may be demonstrated by teachers' flexibility within activities and respect for students' autonomy to participate in and initiate activities.
Classroom Organization	
Behavior management	Encompasses teachers' ability to use effective methods to prevent and redirect misbehavior, by presenting clear behavioral expectations and minimizing time spent on behavioral issues.
Productivity	Considers how well teachers manage instructional time and routines so that students have the maximum number of opportunities to learn. Not related to the quality of instruction, but rather teachers efficiency.
Instructional learning formats	The degree to which teachers maximize students' engagement and ability to learn by providing interesting activities, instruction, centers, and materials. Considers the manner in which the teacher facilitates activities so that students have opportunities to experience, perceive, explore, and utilize materials.
Instructional Support (General)	
Concept development*	The degree to which instructional discussions and activities promote students' higher order thinking skills versus focus on rote and fact-based learning.
Quality of feedback	Considers teachers' provision of feedback focused on expanding learning and understanding (formative evaluation), not correctness or the end product (summative evaluation).
Language modeling (pre-k to 3rd)	The quality and amount of teachers' use of language-stimulation and language-facilitation techniques during individual, small-group, and large-group interactions with children. Components of high-quality language modeling include self and parallel talk, open-ended questions, repetition, expansion/extension, and use of advanced language.
Content understanding (6th to 12th)	Refers to the emphasis and approaches the teacher uses to help students understand both the broad framework and key ideas in an academic discipline. This is viewed in part as a continuum ranging from an isolated set of facts, vocabulary definitions, etc. to an integrated understanding of key concepts and principles.
Analysis and problem solving (6th to 12th)	Reflects the emphasis and approaches the teacher uses to help students engage in higher order thinking skills. Emphasis is on analysis, integration, and application of knowledge and skills through problem solving, reasoning, and experimentation. Opportunities for demonstrating metacognition; that is, thinking about thinking, are also included.
Procedures and skills (6th to 12th)	Measures the degree to which the teacher presents explicit learning opportunities that enhance the students' ability to remember how and when to utilize procedures, algorithms, and skills.

*Concept Development is relevant across grades, but it is differentiated within secondary settings to include both Content Understanding and Analysis and Problem Solving.

Downer, 2009). Drawing from a sample of over just under 4,000 preschool to fifth grade classrooms that were a part of several large, national and regional studies, Hamre and colleagues (2009) first examined the different observational instruments used in these studies and sorted observed dimensions of classroom process into the domains described by the CLASS Framework. They then used confirmatory factor analysis to examine the extent to which the three-latent domain organization of classroom interactions was consistent with actual observations in large numbers of classroom settings across grades and samples. Results indicated adequate fit of the three-factor model across variations in grade or sample, and in each instance the fit of this model was superior to a one- or two-factor model. Such findings provide evidence that the three-domain structure suggested by the CLASS Framework provides a reasonably good fit

to the natural variation in proximal processes observed in classrooms from preschool to fifth grade.

A final distinction between the CLASS Framework and other conceptualizations of classrooms is that the focus on a latent structure of proximal processes was conceptualized to apply to classroom contexts across all grades, from preschool to high school; thus the three-domain latent structure is hypothesized as grade-invariant. Yet, although latent structure is hypothesized as invariant, the CLASS Framework does allow for variation in the specific dimensions of teaching that could vary from preschool to high school (see Figure 3.1) both in terms of added or different dimensions and the specific behavioral indicators that might be organized within dimensions. Nonetheless, the overall structure for classroom interactions in three broad domains is assumed to remain constant.

The CLASS Framework In the next section we review the three major domains of classroom environment described in the CLASS Framework, including a discussion of the relevance of the domain to educational practice and the developmental theories on which they are based. Within each broad domain, we review literature on specific classroom dimensions with empirically supported links to child and adolescent outcomes. It is beyond the scope of this chapter to provide an exhaustive review of research in each domain; however, the literature cited provides examples of relevant work from educational and developmental research.

Emotional Supports As a behavioral setting, classrooms run on interactions between and among participants: relationships between students and teachers and relationships of students with one another. It is not an overstatement to suggest that most children and adolescents *live* for their social relationships (Collins & Repinski, 1994). Students who are more motivated and connected to teachers and peers demonstrate positive trajectories of development in both social and academic domains (Buhs, Ladd, & Herald, 2006; Gregory & Weinstein, 2004; Hamre & Pianta, 2001; Harter, 1996; Ladd, Birch, & Buhs, 1999; Pianta, Steinberg, & Rollins 1995; Resnick et al., 1997; Roeser et al., 2000; Ryan, Stiller, & Lynch, 1994; Silver et al., 2005; Wentzel, 1999). Students' social and emotional functioning in the classroom is embedded in teachers' and students' views of what constitutes school success (Blair, 2002; Denham & Weissberg, 2004; Raver, 2004) and even has been advanced as a student outcome that might be governed by a set of standards similar to those for academic achievement (Illinois State Board of Education, 2004). Yet, the ways in which classrooms provide emotional supports to students or encourage the development of social and emotional knowledge and skills are frequently afterthoughts in battles over curricula and testing.

Two broad areas of developmental theory guide much of the work on emotional support in classrooms, specifically attachment theory (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969; Pianta, 1999) and self-determination theory (Connell & Wellborn, 1991; Ryan & Deci, 2000; Skinner & Belmont, 1993). Attachment theory (Ainsworth et al., 1978; Bowlby, 1969) has been broadly applied to and validated in school environments in research demonstrating the value of the child–teacher relationship to developmental outcomes and self-reliant classroom behavior (Birch & Ladd, 1998; Hamre & Pianta, 2001; Howes, Hamilton, & Matheson, 1994; Lynch & Cicchetti, 1992; Pianta, 1999). Self-determination (or self-systems) theory (Connell & Wellborn, 1991; Ryan & Deci, 2000; Skinner & Belmont, 1993) suggests that the quality of emotional supports available to children affects child outcomes as a function of motivation; children are most motivated to learn when adults support their need to feel competent, positively related to others, and autonomous (Eccles & Roeser, 1998). Related work by Wentzel (1999, 2002) suggests that students who see teachers as supportive are more likely to

pursue goals valued by teachers, such as engagement in academic activities.

Building from these two theoretical backgrounds, the CLASS Framework posits three dimensions of emotional support in the classroom: Classroom Climate, Teacher Sensitivity, and teachers' Regard for Student Perspectives, each of which reflects a different feature of interactions and classroom processes in relation to the overall emotional supportiveness in the classroom setting. These dimensions and associated indicators are described below.

Classroom climate encompasses the emotional qualities of relationships and interactions within the classroom, including student–teacher and peer relationships. The dimension focuses on the emotional tone of interactions, expressions of emotional experiences, and signaling of emotional states both in terms of valence (positive or negative) and intensity. Students with more positive and less conflictual relationships with teachers display greater peer competencies and show more positive academic development (Birch & Ladd, 1996, 1998; Bryk & Driscoll, 1988; Connell & Wellborn, 1991; Crosnoe, Johnson, & Elder, 2004; Hamre & Pianta, 2001; Ladd et al., 1999; Pianta et al., 1995; Roeser et al., 2000; Silver et al., 2005; van Ijzendoorn et al., 1992). These relationships with adults may be particularly critical during middle and high school as a way to enhance student motivation and academic success in school and emotional functioning outside of school (Gregory & Weinstein, 2004; Resnick et al., 1997; Roeser et al., 1998; Skinner, Zimmer-Gembeck, & Connell, 1998).

Peer relations are also fundamental to any description of classroom climate. Children who experience peer rejection or victimization in the early years of schooling are likely to have continued problems as they mature, including social difficulties and academic failure (Asher, Parkhurst, Hymel, & Williams, 1990; Buhs & Ladd, 2001; Buhs et al., 2006; Cassidy & Asher, 1992; Ladd, Kochenderfer, & Coleman, 1997; Ladd & Troop-Gordon, 2003). Being in a classroom characterized by high levels of peer aggression appears to be particularly problematic for boys who start school with high levels of aggression (Kellam, Ling, Merisca, Brown, & Ialongo, 1998). On the more positive side, adolescents who feel support from classroom peers feel more positive and interested in school (Hamm & Faircloth, 2005) and pursue more prosocial goals (Wentzel, 1999).

Teacher sensitivity is another key dimension of the degree of emotional support provided in classrooms. Sensitive teachers monitor all children in the room, are attuned and responsive to the individual cues and needs of students in their classrooms and, through their consistent and responsive interactions, help students see adults as a resource and create environments in which students feel safe and free to explore and learn (Pianta et al., 2007). Students in classrooms with sensitive teachers are more engaged and self-reliant in the classroom and have lower levels of mother-reported internalizing problems than do those with less sensitive teachers (NICHD, ECCRN, 2003b; Rimm-Kaufman et al., 2002). Sensitive teaching is not only

important to social outcomes, but to academic outcomes as well. For example, among a group of preschoolers, those who experienced more responsive teacher interactions in preschool displayed stronger vocabulary and decoding skills at the end of first grade (Connor, Son, & Hindman, 2005) and highly sensitive teaching has also been shown to be related to closing achievement gaps for young students at risk of poor performance (Hamre & Pianta, 2005).

A final dimension of emotional support is the degree to which classrooms and interactions are structured around the interests and motivations of the teacher, versus those of the students, referred to within the CLASS Framework as *Regard for Student Perspectives*. This dimension is often studied within the developmental literature under the construct of autonomy support (e.g., Anderman & Midgley, 1998; Skinner & Belmont, 1993). In classrooms high on this dimension teachers frequently ask for students' ideas and thoughts, follow students' lead, and provide opportunities for students to have a *formative* role in the classroom. Young children report more positive feelings about school, display more motivation, and are more engaged when they experience more child-focused and autonomy supportive instruction (de Kruif, McWilliam, Ridley, & Wakely, 2000; Gutman & Sulzby, 2000; Pianta, La Paro, Payne, Cox, & Bradley, 2002; Valeski & Stipek, 2001), while children in more teacher-directed classrooms have higher levels of internalizing problems (NICHD, ECCRN, 2003b). Similarly, adolescents are engaged by challenges that are within reach and that provide a sense of self-efficacy and control: experiences that offer challenges viewed as adultlike but for which appropriate scaffolding and support are provided (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Eccles, Midgley et al., 1993). When teachers do this well, adolescents report being more motivated to learn, more engaged, and happier with the school environment (Deci, Vallerand, Pelletier, & Ryan, 1991; Eccles & Midgley, 1989; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Roeser et al., 2000).

Classroom Organization and Management In the education literature focused on teaching and teacher training perhaps no other aspect of classroom practice receives as much attention as classroom management and organization. Management of time and of students is an area of great concern to new and experienced teachers. On the student side, self-regulatory skills show strong links to success in all areas of schooling and are highly valued as an outcome (Raver, 2004). Thus, the extent to which classrooms are organized and managed has relevance in a number of ways: as an indicator of teacher competence, as a focus of teachers' concerns, as a source of input to the development of self-regulatory skills, and ultimately as a foundation for learning academic skills.

From a developmental standpoint the theoretical underpinnings of this domain include work by psychologists interested in children's self-regulatory skills (Blair, 2002; Paris & Paris, 2001; Raver, 2004; Tobin & Graziano, 2006). These self-regulatory skills include the development of

memory, attention, planning, and inhibitory control, all of which have clear relevance to success in school environments. Children's self-regulatory behaviors are multidetermined, with family processes and individual differences (e.g., temperament, personality) contributing to children's ability to self-regulate in home, school, and laboratory environments (e.g., Blair, 2002; Connell & Wellborn, 1991; Grolnick & Ryan, 1989; Rimm-Kaufman et al., 2002; Rubin, Coplan, Fox, & Calkins, 1995; Tobin & Graziano, 2006). Recent advancements in developmental neuroscience, suggesting rapid growth and changes in brain areas associated with self-regulation during early childhood years, have placed particular emphasis on the role of preschool and elementary classrooms in developing these skills (Blair, 2002). Surprisingly, despite the clear need for research in this area, few studies have examined how specific classroom processes intersect with the *development* of self-regulatory skills (see Arnold, McWilliams, & Arnold, 1998; Cameron, Connor, Morrison, 2005 for exceptions) with most research instead focused more simply on correlations between the provision of organization and management to more positive classroom attention and behavior.

In the CLASS Framework, classroom organization is a broad domain of classroom processes related to the organization and management of students' *behavior, time, and attention* in the classroom (Emmer & Strough, 2001). The framework suggests three dimensions of this classroom-level regulation: Behavior Management, Productivity, and Instructional Learning Formats, each of which contributes to aspects of the classroom as a predictable, consistent, engaging setting.

Behavior management is a term that is often applied to a broad spectrum of classroom management strategies, including teachers' abilities to engage students and make constructive use of time. Within the CLASS Framework, behavior management is defined more narrowly as practices intended to *promote positive behavior* and *prevent or terminate misbehavior* in the classroom. There is general consensus around a set of practices associated with more positive student behavior including: (1) providing clear and consistent behavioral expectations; (2) monitoring the classroom for potential problems and proactively preventing problems rather than being reactive; (3) efficiently redirecting minor misbehavior before it escalates; (4) using positive, proactive strategies such as praising positive behavior rather than calling attention to misbehavior; and (5) spending a minimal amount of time on behavior management issues (Emmer & Strough, 2001).

Most of the research on behavior management was conducted by educational researchers in the 1970s and 1980s; these studies indicated that elementary and middle classrooms with positive behavior management tend to have students who make greater academic progress (Good & Grouws, 1977; Soar & Soar, 1978). Furthermore, teachers who adopt these types of practices after training are more likely than teachers in control groups to have students who are engaged and learning (Emmer & Strough, 2001;

Evertson, Emmer, Sanford, & Clements, 1983; Evertson & Harris, 1999; Gottfredson, Gottfredson, & Hybl, 1993). More recent school and classroom intervention programs have found similar results (Tingstrom, Sterling-Turner, & Wilczynski, 2006).

In *productive* classrooms teachers are not only effective managers of behavior, but are well-organized, spend a minimal amount of time on basic management activities such as taking attendance or passing out and collecting homework, and are prepared for instructional activities so that little time is lost in transition. Highly productive classrooms may resemble a “well-oiled machine” in which everyone in the classroom seems to know what is expected of them and how to go about doing it (Pianta et al., 2008). Productivity serves as a measure of the “dosage” of schooling students receive on a daily basis. Students are most engaged in productive classrooms and this engagement, in turn, is directly associated with student learning (Brophy & Evertson, 1976; Cameron et al., 2005; Coker, Medley, & Soar, 1980; Good & Grouws, 1977; Stallings, 1975; Stallings, Cory, Fairweather, & Needels, 1978).

For students to learn, they must have more than something to do; they must also be effectively engaged and interested in the instructional activities provided to them, a dimension of classrooms referred to within the CLASS Framework as *Instructional Learning Formats*. As stated by Yair (2000), “Highly engaging instructional settings encourage students to immerse themselves in learning, buffering their consciousness from external intrusions, and hence maximize the use of opportunities to learn” (p. 249). Consistent with constructivist theories of learning (Bowman & Stott, 1994; Bruner, 1996; Rogoff, 1990; Vygotsky, 1978), when teachers provide high quality learning formats, students are not just *passively* engaged in learning, but are *active* participants in it.

Some of the most novel work on the ways classroom environments may stimulate or alienate students’ attention comes from researchers using experience sampling method (ESM) to capture students’ perceptions of engagement and external factors that may influence engagement at randomly sampled periods throughout the school day (Csikszentmihalyi & Larson, 1987; Yair, 2000). In one study of 6th through 12th grade students, Yair (2000) found that levels of student reported engagement were highest when students were participating in more active methods such as labs and groups and lowest during lectures. Unfortunately, these more active methods were infrequent, occurring only 3% of the sampled time, with lectures occurring much more frequently, a finding corroborated in recent observational studies of elementary school classrooms nationwide (Pianta, Belsky, Houts, Morrison, & the NICHD Early Child Care Research Network, 2006).

Instructional Supports The previous sections discussed the ways in which classrooms’ provision of nurturing and supportive emotional environments and clear and consistent organizational systems may provide students with

opportunities to learn, promote self-regulation, and foster emotional development and motivation. These two broad areas set the stage for what most consider the main goal of schooling—to educate children. The conceptualization of effective classroom environments requires attending to the nature and quality of instructional interactions in the classroom. Instructional methods have been put in the spotlight in recent years as more emphasis has been placed on the translation of cognitive science, learning, and developmental research to educational environments (Carver & Klahr, 2001). The exemplary work of the National Research Councils series, *How Students Learn* (Donovan & Bransford, 2005) summarizes research across disciplines to emphasize how specific teaching strategies can enhance students’ learning (Bransford et al., 2000).

The theoretical foundation for the conceptualization of instructional supports in the CLASS Framework comes primarily from research on children’s cognitive and language development (e.g., Carver & Klahr, 2001; Catts, Fey, Zhang, & Tomblin, 2001; Fujiki, Brinton, & Clarke, 2002; Romberg, Carpenter, & Dremlack, 2005; Taylor, Pearson, Peterson, & Rodriguez, 2003; Vygotsky, 1991; Wharton-McDonald, Pressley, & Hampston, 1998). This literature highlights the distinction between simply learning facts and gaining “usable knowledge” which is built upon learning how facts are interconnected, organized, and conditioned upon one another (Bransford et al., 2000; Mayer, 2002). A student’s cognitive and language development is contingent on the opportunities adults provide to express existing skills and scaffold more complex ones (Davis & Miyake, 2004; Skibbe, Behnke, & Justice, 2004; Vygotsky, 1991). The development of “metacognitive” skills, or the awareness and understanding of one’s thinking processes, is also critical to children’s academic development (Veenman, Kok, & Blöte, 2005; Williams, Blythe, & White, 2002).

Because of the significant shifts in classroom goals and students’ cognitive abilities as children mature, the individual dimensions described as a part of Instructional Supports vary more by grade level than do those in the Emotional Support or Classroom Organization domains. The instructional dimensions become more differentiated in middle and high school as a greater emphasis is placed on content (Figure 3.1). So, for example, while Concept Development is a dimension of relevance for younger children, this dimension is broken down into Content Understanding and Analysis and Problem Solving for middle and high school classrooms. In addition, there is an explicit focus on increasing general language skills as children enter elementary school, while learning specific procedures and skills becomes more important as students mature. For the purposes of this chapter, we focus on reviewing literature for the dimensions of Concept Development and Quality of Feedback, which are relevant across the grade levels.

Concept development describes the instructional behaviors, conversations, and activities that teachers use to help stimulate students’ higher order thinking skills, cognitions,

and understanding of content (Pianta et al., 2008). Learning requires not only the acquisition of knowledge (retention), but the ability to access and apply this knowledge in new situations (transfer). Teachers can facilitate this transfer process by providing students with opportunities to: *understand*—build connections between new and previous knowledge; *apply*—use procedures and knowledge to help solve new problems; *analyze*—divide information into meaningful parts; *evaluate*—make conclusions based on criteria or standards; and *create*—put pieces of knowledge together to produce new ideas (Mayer, 2002). Teachers who use concept development practices tend to have students who make greater achievement gains (Romberg et al., 2005; Taylor, et al., 2003; Wharton-McDonald et al., 1998). As noted by Brophy and Good (1986), this does not require that all of a teacher’s questions are “higher level” questions, but that there is a balance in which teachers use higher level questions to help focus student attention on the process of learning rather than solely on the product.

Another major part of effective concept development is making content and instruction relevant and meaningful to students, because there is a direct link between relevance and understanding of information (Barron, Schwartz, & Vye., 1998). Engaging high school students in this type of instruction can have powerful effects. For example, involving students in significant, real-world, voluntary community service and then discussing it within the classroom in an ongoing way, has been found to reduce failure rates by 50%, in randomly controlled trials, with similarly profound effects upon other behaviors in youths’ lives as well (Allen, Philliber, Herrling, & Kuperminc, 1997). Thus, the extent to which teachers make opportunities for problem and project-based learning available to students is a key part of the ability of classrooms to stimulate higher order thinking skills and cognition (Barron et al., 1998).

In order to get the most benefit from the instructional opportunities described above, students need feedback about their learning. *Feedback* is a term used in education to refer to a broad range of teachers’ interactions with students in which the teacher provides some information back to the student about his or her performance or effort. Research on feedback has typically focused on praise (Brophy & Everton, 1976; Stallings, 1975) or attributional feedback, in which teachers make statements to students attributing their performance to either ability (e.g., “You did this well because you are a good reader”) or effort (e.g., “You did this well because you worked hard”) (Burnett, 2003; Dohrn & Bryan, 1994). Although the CLASS Framework definition includes these forms of feedback, the focus is on “instructional feedback” or feedback that provides students with specific information about the content or process of learning.

High quality feedback is described as communications from teachers that provide students with specific information about not only whether or not they are correct (Brophy & Good, 1986), but about how they might get to the correct answer. Teachers providing high quality feedback provide

frequent feedback loops, or back and forth exchanges in which a teacher responds to an initial student comment by engaging with the student, or group of students, in a sustained effort to reach deeper understanding (Pianta et al., 2008). Educational researchers have referred to this type of feedback interaction as scaffolded instruction (Many, 2002). Classrooms offering higher quality feedback, have students who display greater gains in literacy and language across the preschool and kindergarten years (Howes et al., 2008; Mashburn et al., 2008) and appear to contribute to a closing of the achievement gap among first grade students coming from disadvantaged backgrounds (Hamre & Pianta, 2005). In one study of fourth and fifth grade classrooms, teachers who used these strategies as a part of instructional conversations had students who showed greater improvements in the quality of their essays than did students in a control condition who did not receive these supports (Saunders & Goldenberg, 1999).

Measuring Classroom Environments

For the science of classroom environments to move forward, there is a need for measurement tools that reliably assess the types of classroom environments described by the CLASS Framework. There has been considerable progress in measurement of classroom environments over the past 10 years, particularly in the area of standardized observations. In the next section we summarize research on the two most common types of measures: observations and questionnaires.

Classroom Observations There is a long history of classroom observation in educational research, although the extent to which classroom processes can be reliably and validly assessed has been a subject of great debate within educational research community for the past 30 years (Gage & Needels, 1989). Until recently, most standardized observations of classrooms were conducted as a part of research referred to as “process-product” research. Process-product research relied heavily on gathering frequency data on specific types of classroom interactions and occurrences and linking these to student outcomes. Brophy and Good (1986) offer a thorough summary of this research. Within the educational research community, this research was criticized for, among other things, reliance on decontextualized, discrete observations that did not accurately portray the complexity of classroom environments (Gage, 1989; Gage & Needels, 1989). The result of these criticisms was that very few educational researchers used standardized methods of observation during the 1990s, relying instead on qualitative observational methods.

More recently, developmental scientists have used their experiences in observation in home settings to create new observational measures of classroom environments that address some of the early critiques. Much of this work was stimulated by the NICHD Study of Early Childhood and Youth Development (SECCYD; NICHD, ECCRN, 2003a)

which followed a cohort of children from birth through early adolescence. As children entered school settings, researchers realized a need to develop new observational tools. The measures used in the NICHD SECCYD proved successful in capturing a wide range of features of the classroom environment that were related to students' social and academic development across childhood and early adolescence (Gazelle, 2006; Hamre & Pianta, 2005; NICHD, ECCRN, 2002, 2005; Pianta et al., 2006; Rimm-Kaufman et al., 2002). These measures extended previous work by measuring more complex patterns of interactions than can be captured with frequency counts of behavior. Other researchers have developed similar observational measures, some of which are specific to one domain of the classroom environment (e.g., Howes, 2000; Morrison & Conner, 2002; Patrick et al., 1997; Taylor et al., 2003) and others that are more global (Pianta et al., 2007; Pianta, Hamre et al., 2006; Pressley, Gaskins, Solic, & Collins, 2006; Stipek & Byler, 2004).

Researchers interested in conducting classroom observations are faced with a variety of measurement decisions which have important implications for resulting data. One of the issues that arises most frequently is the extent to which measures capture the *frequency* or *quality* of behaviors. Examples of behaviors assessed by frequency measures include: time spent on literacy instruction, the number of times teachers ask questions during instructional conversations, and the number of negative comments made by peers to one another. Quality measures may instead rate the degree to which literacy instruction in a classroom matches a description of evidence-based practices, how much instructional conversations stimulate children's higher-order thinking skills, and the extent to which classroom interactions contain a high degree of negativity between teachers and students and among peers.

Frequency measures typically rely on time sampling methods while quality is assessed using rating systems; however, this distinction can sometimes be blurred. For instance, some measures that rely on assessing the presence of certain behaviors or interactions can focus on behaviors that have a quality component to them (e.g., Morrison & Conner, 2002). Thus, rather than measuring simply the number of questions a teacher asks, researchers interested in the cognitive demands of instructional conversations could, for example, count the number of closed questions (e.g., "What are the three parts of an insect's body called?") versus open questions that require higher levels of cognition (e.g., "Tell me two similarities and two differences between a spider and an insect?"). Similarly, many quality measures take into account the frequency of a group of behaviors in making the quality rating. For example, several measures make ratings based on the frequency with which a set of quality indicators are observed across a time period (NICHD, ECCRN, 2002; Pianta et al., 2007). So, for example, a teacher who has one brief interaction with a student constituting a high degree of teacher sensitivity, but who is quite insensitive for the rest of the observation period receives a lower score

than does a teacher who is consistently sensitive across time and students.

There are advantages to each type of system. Quality measures assess higher order organizations of behaviors in ways that may be more meaningful than looking at the discrete behaviors in isolation and tend to parse the behavioral stream into more contextually and situationally sensitive "chunks." For example, teachers' positive affect and smiling can have different meanings and may be interpreted differently depending on the ways in which this affect is responded to by students in the classroom. In some classrooms teachers are exceptionally cheerful, but their affect appears very disconnected from that of the students. In other classrooms teachers are more subdued in their positive affect but there is a clear match between this affect and those of their students. A measure that simply counted the number of times a teacher smiled at students would miss these more nuanced interpretations. Another indication of the potential importance of observational measures focused on quality is that similar measures were critical to advancement in other areas of human behavior, such as the development of attachment theory (Ainsworth et al., 1978; Bowlby, 1969) and understanding antisocial behavior in youth (Dishion, Spracklen, Brown, & Haas, 1999).

One distinct advantage to using frequency measures, specifically when they are time-coded is the ability to conduct sequential and contingency analyses, thus allowing for studies of the complex interdependence and flow of interactions (Bakeman & Gnisci, 2006). Among the few researchers who have used this methodology in work on classrooms are those focused on the study of children with emotional and behavioral disorders. For example, Sutherland, Wehby, and Yoder (2002) examined the time-sequenced relationship between teacher praise and the provision of opportunities to respond among a group of children with problem behavior. Erickson, Stage, and Nelson (2006) examined the extent to which they could identify reliable antecedent and consequent events related to inappropriate behavior for children with ADHD diagnoses. Future work using these methods may help paint a more vivid picture of the complex interpersonal interactions among teachers and peers in their everyday interactions with one another.

Student and Teacher Questionnaires The ultimate effect of any observable classroom process on student outcomes is largely mediated by the ways in which individual students make meaning of and respond to it. Therefore, a complete understanding of these environments requires gaining access to the participants' perceptions of these environments. Questionnaires designed to assess the classroom environment have been used in educational research for over 30 years. Fraser (1998) provides a helpful review of the most commonly used classroom environment instruments. Four major issues related to the use of questionnaire data on classroom environments are: the domains of classroom environment on which they focus; whether the reporter is the teacher or students; the age of student reporters; and

the extent to which they measure students' personal or classroom level perceptions of the environment.

Notable among questionnaires on the classroom environment is that they focus almost exclusively on the emotional and organizational aspects of classrooms, with few if any examples of measures providing data on students' perceptions of availability and quality of instructional supports. For example, the most commonly used measure, the Classroom Environment Scale (CES; Moos & Trickett, 1987), has scales measuring involvement, affiliation, teacher support, task orientation, order and organization, and rule clarity. One exception comes from work by Midgley and colleagues (1996) using the Patterns of Adaptive Learning Survey. Several items on this survey assess the degree to which teachers report using strategies that encourage understanding, rather than rote knowledge (Deemer, 2004).

Issues related to the reporter on questionnaires include differences between teacher and student report and the age of students. Most classroom environment questionnaires include both teacher and student report versions; however, research examining relations between teacher and student report have found low to moderate associations (Feldlaufer, Midgley, & Eccles, 1988; Fraser & O'Brien, 1985). In general, teachers report more positive environments than do students (Fisher & Fraser, 1983; Fraser & O'Brien, 1985), so capturing student report data allows for researchers to document the range of students' experiences within the classroom.

Questionnaire methods are much more common in research on middle and secondary classrooms than on elementary classrooms. This is not surprising given the challenges of reliably assessing young children's perceptions; however, there is growing evidence of effective practices for obtaining self-reports from children as young as 5 (Daniels, Kalkman, & McCombs, 2001; Measelle, John, Ablow, Cowan, & Cowan, 2005). One of the few examples of work on young children's perceptions of classroom environments comes from Daniels, Kalkman, and McCombs (2001) who used an interview technique with cartoonlike depictions of classroom situations to elicit kindergarten through second grade students' feelings about their classroom. This measure was validated against external judgments about the classroom with evidence of some agreement, but clearly there is a great need for more work in this area.

One final distinction of relevance for those selecting questionnaires to assess the classroom environment is the extent to which they assess students' personal or classroom experiences (Fisher & Fraser, 1983; Fraser, Giddings, & McRobbie, 1995; Fraser & Tobin, 1991). Many classroom environment measures have both types of versions. Personal versions ask students questions specifically about their experiences in the classroom (e.g., "My teacher treats me fairly"), while classroom versions of measures ask questions about students' perceptions of classroom level processes (e.g., "The teacher tends to treat students fairly"). A direct comparison of these two types of measures offers several important distinctions (Fraser et al., 1995). For example,

there are greater gender differences when using the personal versions of the measures and students report more favorable environments using the classroom as compared to the personal version. However, each version accounts for independent variance in student outcomes, suggesting they both may be important aspects of the classroom environment to assess (Fraser & McRobbie, 1995).

Implications and Future Directions for Classroom Environment Research

The literature reviewed above provides strong evidence that emotional, organizational, and instructional processes in classrooms are a key feature accounting for direct and indirect links to children and adolescents' social, emotional, and academic outcomes. There is, however, much about classrooms and their significance for development that is not well-understood. Continued efforts to integrate developmental and educational sciences will produce research that can further our understanding of basic developmental processes as well as inform important educational questions. Below we discuss several limitations of current work that provide direction for future research on classroom environments.

One key weakness of current work is that the vast majority of research on classroom environments and child outcomes is correlational, and thus conclusions about effects are qualified by the lack of rigor in methods and design. Even though there is a growing body of experimental work on school-based interventions (Greenberg, Weissberg, & O'Brien, 2003), until recently few of these studies included observational measures of classroom environments; thus even when these interventions yield strong inferences about effects, we know little about the specific types of classroom interactions (i.e., the mechanisms) that resulted in these positive effects. There are some exceptions, including early work by process-product researchers on behavior management (Emmer & Strough, 2001; Evertson et al., 1983; Evertson & Harris, 1999) as well as several programs of research on school-based intervention, such as the Child Development Project (CDP; Battistich, Solomon, Watson, & Schaps, 1997) and the School Transitional Environment Project (Felner et al., 2001). The increased use of experimental designs within classroom research, along with the inclusion of observational methods, may provide evidence meeting the dual goals of informing developmental science and providing useful information to educational practitioners.

Measurement is also a key challenge, with one of the primary limitations of research to date being the use of different methodologies among research on early childhood, elementary, middle, and high school classrooms. There is a dire need for research in middle and high school classrooms that focuses more closely on measurement and methodological issues in the use of observations. In addition, we know too little about how to improve assessments that rely on young students' report about classroom environments.

Finding a way to more coherently bridge literatures that were developed using these different methodologies will be critical to the understanding of the nature of classroom experiences across the preschool to high school period.

In addition, the thoughtful integration of new developmentally salient constructs could help revolution the science of classroom environments in much the same way as they did for research in other areas of development (e.g., Gottman & Notarius, 2002). For example, the inclusion of measures of cortisol levels in classroom-based research (Gunnar, Sebanc, & Tout, 2003; Tout, de Haan, Campbell, & Gunnar, 1998) has produced some intriguing findings such as the fact that within child care, cortisol levels rise over the course of the day (in contrast to typical patterns in which cortisol levels decrease from morning to afternoon) and that this rise is associated with higher levels of internalizing behavior for boys (Tout et al., 1998). Linking cortisol and other physiological measures directly to classroom processes would enhance our understanding of the ways in which classroom environments exert their influence on children's development.

A final challenge concerns the ability of developmental scientists to successfully bridge the lab with the classroom. This has happened more successfully in some areas of developmental science than in others. Carver and Klahr (2001) discuss the many challenges inherent in conducting research on children's cognitive development that is relevant to classroom settings. They suggest that the current separation between basic cognitive research and classroom research prohibits the effective use of research in classroom settings. Two remedies to this problem include the provision of a conceptual framework for classifying cognitive research in ways that are meaningful to educators as well as encouraging the development, implementation, and evaluation of specific instructional materials and approaches. The CLASS Framework is one approach to the first remedy. As outlined above, each dimension described by the CLASS is well established as a relevant aspect of classrooms, about which teachers, administrators, and policymakers are concerned. Future research may use the CLASS Framework, or other similar frameworks, as a starting place for approaching the second remedy—designing, implementing, and testing specific classroom strategies hypothesized to have a direct effect on students' social, regulatory, and cognitive functioning. The key here is that this research must be conducted in real classrooms and must make an active effort to model and measure *normative* classroom practices, rather than focusing solely on some manipulated process identified in lab-based research.

As work on classroom environments continues, it is essential to remember that, consistent with the tenets of bio-ecological theory (Bronfenbrenner & Morris, 1998), the ultimate results of any processes, such as those present in classroom environments, are dependent upon a complex interaction of those processes with characteristics of the people involved, the setting or context, and time. It would be inconsistent with the principles upon which the

CLASS Framework is based to assume that the classroom environments described above operate in the same way for all students, teachers, or classrooms. Rather, they describe general classroom processes involved in children's development, and thereby form the basis of numerous examinations of this complex process-person-context-time model (Bronfenbrenner & Morris, 1998) as applied to classroom and school settings. For example, it will be important for future research to examine the extent to which child characteristics may moderate the ultimate effect of process on children's development (e.g., Hamre & Pianta, 2005; Rimm-Kaufman et al., 2002), ways in which culture can influence the meaning of observed behaviors (Inagaki, Morita, & Hatano, 1999; Rogoff, 2003), and the extent to which these basic classroom processes may change as children move from preschool through high school. Further explorations of the complicated nature of classrooms will offer insights into larger developmental theories (Pianta, 2006) and have many potential implications for the ways in which findings on classroom processes are translated into practice.

References

- Ainsworth, M. D., Blehar, M. C., Waters, E., & Wall, D. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum.
- Alexander, K. L., & Entwisle, D. R. (1988). Achievement in the first 2 years of school: Patterns and processes. *Monographs of the Society for Research in Child Development*, 53(2), 157.
- Allen, J. P., Philliber, S., Herrling, S., & Kuperminc, G. P. (1997). Preventing teen pregnancy and academic failure: Experimental evaluation of a developmentally based approach. *Child Development*, 68(4), 729–742.
- Anderman, L. H., & Anderman, E. M. (1999). Social predictors of changes in students' achievement goal orientations. *Contemporary Educational Psychology*, 25, 21–37.
- Anderman, L. H., & Midgley, C. (1998). Motivation and middle school students. *ERIC Digest*, EDO-PS-98-5.
- Arnold, D. H., McWilliams, L., & Arnold, E. H. (1998). Teacher discipline and child misbehavior in day care: Untangling causality with correlational data. *Developmental Psychology*, 34, 276–287.
- Asher, S. R., Parkhurst, J. T., Hymel, S., & Williams, G. A. (1990). Peer rejection and loneliness in childhood. In S. R. Asher & J. D. Coie (Eds.), *Peer rejection in childhood* (pp. 253–273). New York: Cambridge University Press.
- Bakeman, R., & Gnisci, A. (2006). Sequential observation methods. In M. Eid & E. Diener (Eds.), *Handbook of multimethod measurement in psychology* (pp. 127–140). Washington, DC: American Psychological Association.
- Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development*, 67(3), 1206–1222.
- Barron, B. J. S., Schwartz, D. L., Vye, N. J., & Cognition & Technology Group, Vanderbilt University, Learning Technology Center. (1998). Doing with understanding: Lessons from research on problem-and project based learning. *Journal of the Learning Sciences*, 7(3–4).
- Barron, B., Schwartz, D., Vye, N., Moore, A., Petrosino, A., Zech, L., Bransford, J., & Cognition and Technology Group, Vanderbilt University. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *Journal of the Learning Sciences*, 7, 271–312.

- Battisch, V., Solomon, D., Watson, M., & Schaps, E. (1997). Caring school communities. *Educational Psychologist, 32*(3), 137–151.
- Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. [Special issue]. *Journal of Early Adolescence, 11*(1), 56–95.
- Birch, S. H., & Ladd, G. W. (1996). Interpersonal relationships in the school environment and children's early school adjustment. In K. Wentzel & J. Juvonen (Eds.), *Social motivation: Understanding children's school adjustment* (pp. 199–225). New York: Cambridge University Press.
- Birch, S. H., & Ladd, G. W. (1998). Children's interpersonal behaviors and the teacher-child relationship. *Developmental Psychology, 34*, 934–946.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*(2), 111–127.
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. New York: Basic Books.
- Bowman, B., & Stott, F. (1994). Understanding development in a cultural context: The challenge for teachers. In B. Mallory & R. New (Eds.), *Diversity and developmentally appropriate practices: Challenges for early childhood education* (pp. 19–34). New York: Teachers College Press.
- Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school: Expanded edition*. Washington, D.C.: National Academy Press.
- Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 993–1029). New York: Wiley.
- Brophy, J. (1999). Teaching (Educational Practices Series No. 1). Geneva: International Bureau of Education. Retrieved January 20, 2010, from <http://www.ibe.unesco.org/International/Publications/EducationalPractices/prachome.htm>
- Brophy, J., & Evertson, C. (1976). *Learning from teaching: A developmental perspective*. Boston, MA: Allyn & Bacon.
- Brophy, J., & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 328–375). New York: Macmillan.
- Bruner, J. (1996). *The culture of education*. Cambridge, MA: Harvard University Press.
- Bryk, A. S., & Driscoll, M. (1988). *The high school as a community: Contextual influences and consequences for teachers*. Madison, WI: University of Wisconsin, National Center on Effective Secondary Schools.
- Buhs, E., & Ladd, G. W. (2001). Peer rejection as antecedent of young children's school adjustment: An examination of mediating processes. *Developmental Psychology, 37*, 550–560.
- Buhs, E., Ladd, G., & Herald, S. (2006). Peer exclusion and victimization: Processes that mediate the relation between peer group rejection and children's classroom engagement and achievement? *Journal of Educational Psychology, 98*(1), 1–13.
- Burnett, P. C. (2003). The impact of teacher feedback on student self-talk and self-concept in reading and mathematics. *Journal of Classroom Interaction, 38*(1), 11–16.
- Cameron, C. E., Connor, C. M., & Morrison, F. J. (2005). Effects of variation in teacher organization on classroom functioning. *Journal of School Psychology, 43*(1), 61–85.
- Carver, S. M., & Klahr, D. (2001). *Cognition and instruction: Twenty-five years of progress*. Mahwah, NJ: Erlbaum.
- Cassidy, J., & Asher, S. R. (1992). Loneliness and peer relations in young children. *Child Development, 63*, 350–365.
- Catts, H. W., Fey, M. E., Zhang, X., & Tomblin, J. B. (1999). Language basis of reading and reading disabilities: Evidence from a longitudinal investigation. *Scientific Studies of Reading, 3*(4), 331–361.
- Catts, H., Fey, M. E., Zhang, X., & Tomblin, J. B. (2001). Estimating risk for future reading difficulties in kindergarten children: A research-based model and its clinical implications. *Language, Speech, and Hearing Services in Schools, 32*, 38–50.
- Cicchetti, D., & Aber, J. L. (1998). Editorial: Contextualism and developmental psychopathology. *Development and Psychopathology, 10*(2), 137–141.
- Coker, H., Medley, D. M., & Soar, R. S. (1980). How valid are expert opinions about effective teaching? *Phi Delta Kappan, 62*(2), 131–134, 149.
- Collins, W. A., & Repinski, D. J. (1994). Relationships during adolescence: Continuity and change in interpersonal perspective. In R. Montemayor, G. Adams, & T. P. Gullotta (Eds.), *Personal relationships during adolescence* (pp. 7–36). San Francisco, CA: Sage.
- Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy, and relatedness: A motivational analysis of self-system processes. In R. Gunnar & L. A. Sroufe (Eds.), *Minnesota Symposia on child psychology* (Vol. 23, pp. 43–77). Hillsdale, NJ: Erlbaum.
- Connor, C. M. (2005). *Individual students' differences in response to preschool literacy instruction: Effects on vocabulary, alphabet and letter-word recognition skill growth*. A presentation made at the Society for the Scientific Study of Reading, Toronto, Canada.
- Connor, C. M., Morrison, F. J., & Petrella, J. (2004). Effective reading comprehension instruction: Examining child x instruction interactions. *Journal of Educational Psychology, 96*(4), 682–698.
- Connor, C. M., Son, S., & Hindman, A. H. (2005). Teacher qualifications, classroom practices, family characteristics, and preschool experience: Complex effects on first graders' vocabulary and early reading outcomes. *Journal of School Psychology, 43*(4), 343–375.
- Crosnoe, R., Johnson, M. K., & Elder, G. H., Jr. (2004). Intergenerational bonding in school: The behavioral and contextual correlates of student-teacher relationships. *Sociology of Education, 77*(1), 60–81.
- Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience-sampling method. *The Journal of Nervous and Mental Disease, 175*, 526–536.
- Daniels, D. H., Kalkman, D. L., & McCombs, B. L. (2001). Young children's perspectives on learning and teacher practices in different classroom contexts: Implications for motivation. *Early Education and Development, 12*(2), 253–273.
- Davis, E. A., & Miyake, N. (2004). Explorations of scaffolding in complex classroom systems. *Journal of the Learning Sciences, 13*(3), 265–272.
- Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *The Educational Psychologist, 26*, 325–346.
- Deemer, S. A. (2004). Classroom goal orientation in high school classrooms: Revealing links between teacher beliefs and classroom environments. *Educational Research, 46*(1), 73–90.
- de Kruif, R. E. L., McWilliam, R. A., Ridley, S. M., & Wakeley, M. B. (2000). Classification of teachers' interaction behaviors in early childhood classrooms. *Early Childhood Research Quarterly, 15*(2), 247–268.
- Denham, S. A., & Weissberg, R. P. (2004). Social-emotional learning in early childhood: What we know and where to go from here. In E. Chesebrough, P. King, T. P. Gullotta, & M. Bloom (Eds.), *A blueprint for the promotion of prosocial behavior in early childhood* (pp. 13–50). New York: Kluwer Academic/Plenum.
- Dishion, T. J., Li, F., Spracklen, K. M., Brown, G., & Haas, E. (1999). The measurement of parenting practices in research

- on adolescent problem behavior: A multimethod and multitrait analysis. In R. S. Ashery (Ed.), *Research meeting on drug abuse prevention through family interventions* (NIDA Research Monograph 177, pp. 260–293). Bethesda, MD: National Institute on Drug Abuse.
- Dohrn, E., & Bryan, T. (1994). Attribution instruction. *Teaching Exceptional Children*, 26(4), 61–63.
- Donovan, S., & Bransford, J. (2005). *How students learn: History, mathematics, and science in the classroom*. Washington, DC: National Academy Press.
- Eccles, J. S. (2004). Schools, academic motivation, and stage-environment fit. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 125–153). Hoboken, NJ: Wiley.
- Eccles, J. S., & Midgley, C. M. (1989). Stage-environment fit: Developmentally appropriate classrooms for young adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 139–186). San Diego, CA: Academic Press.
- Eccles, J. S., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., et al. (1993). Development during adolescence: The impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist*, 48(2), 90–101.
- Eccles, J. & Roeser, R. (1998). School and community influences on human development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (4th ed., pp. 503–554). Mahwah, NJ: Erlbaum.
- Eccles, J. S., & Roeser, R. W. (1999). Adolescents' perceptions of middle school: Relation to longitudinal changes in academic and psychological adjustment. *Journal of Research on Adolescence*, 8(1), 123–158.
- Eccles, J. S., & Roeser, R. W. (2005). School and community influences on human development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental science: An advanced textbook* (5th ed., 513–556). Mahwah, NJ: Erlbaum.
- Emmer, E. T., & Strough, L. (2001). Classroom management: A critical part of educational psychology, with implications for teacher education. *Educational Psychologist*, 36(2), 103–112.
- Erickson, M. J., Stage, S. A., & Nelson, J. R. (2006). Naturalistic study of the behavior of students with EBD referred for functional behavioral assessment. *Journal of Emotional and Behavioral Disorders*, 14(1), 31–40.
- Evertson, C., Emmer, E., Sanford, J., & Clements, B. (1983). Improving classroom management: An experiment in elementary classrooms. *Elementary School Journal*, 84, 173–188.
- Evertson, C. M., & Harris, A. H. (1999). Support for managing learning centered classrooms: The classroom organization and management program. In H. J. Freiberg (Ed.), *Beyond behaviorism: Changing the classroom management paradigm* (pp. 57–73). Boston, MA: Allyn & Bacon.
- Feldlaufer, H., Midgley, C., & Eccles, J. (1988). Student, teacher, and observer perceptions of the classroom before and after the transition to junior high school. *Journal of Early Adolescence*, 8(2), 133–156.
- Felner, R., Favazza, A., Shim, M., Brand, S., Gu, K., & Noonan, N. (2001). Whole school improvement and restructuring as prevention and promotion: Lessons from project STEP and the project on high performance learning communities. *Journal of School Psychology*, 39, 177–202.
- Fisher, D. L., & Fraser, B. J. (1983, January). A comparison of actual and preferred classroom environments as perceived by science teachers and students. *Journal of Research in Science Teaching*, 20(1), 55–61.
- Fraser, B. J. (1998). Classroom environment instruments: Development, validity and applications. *Learning Environment Research*, 1, 7–33.
- Fraser, B. J., Giddings, G. J., & McRobbie, C. J. (1995). Evolution and validation of a personal form of an instrument for assessing science laboratory classroom environments. *Journal of Research in Science Teaching*, 32, 399–422.
- Fraser, B. J. & McRobbie, C. J. (1995). Science laboratory classroom environments at schools and universities: A cross-national study. *Educational Research and Evaluation*, 1, 289–317.
- Fraser, B. J., & O'Brien, P. (1985). Student and teacher perceptions of the environment of elementary school classrooms. *Elementary School Journal*, 85, 567–580.
- Fraser, B. J. & Tobin, K. (1991). Combining qualitative and quantitative methods in classroom environment research. In B. J. Fraser & H. J. Walberg (Eds.), *Educational environments: Evaluation, antecedents and consequences* (pp. 271–292). London: Pergamon.
- Fujiki, M., Brinton, B., & Clarke, D. (2002). Emotion regulation in children with specific language impairment. *Language, Speech, and Hearing Services in Schools*, 33(2), 102–111.
- Gage, N.L. (1978). *The scientific basis of the art of teaching*, New York: Teachers College Press.
- Gage, N. L. (1989). The paradigm wars and their aftermath: A "historical" sketch of research on teaching since 1989. *Educational Researcher*, 18(7), 4–10.
- Gage, N. L., & Needels, M. C. (1989). Process-product research on teaching: A review of criticisms. *Elementary School Journal*, 89(3), 253–300.
- Gazelle, H. (2006). Class climate moderates peer relations and emotional adjustment in children with an early childhood history of anxious solitude: A child-by-environment model. *Developmental Psychology*, 42, 1179–1192.
- Good, T., & Grouws, D. (1977). Teaching effects: A process-product study of fourth grade mathematics classrooms. *Journal of Teacher Education*, 28, 49–54.
- Gottfredson, D. C., Gottfredson, G. D., & Hybl, L. G. (1993). Managing adolescent behavior: A multityear, multischool study. *American Educational Research Journal*, 30(1), 179–215.
- Gottman, J. M., & Notarius, C. I. (2002). Marital research in the 20th century and a research agenda for the 21st century. *Family Process*, 41, 159–197.
- Greenberg, M. T., Domitrovich, C., & Bumbarger, B. (2001). The prevention of mental disorders in school-aged children: Current state of the field [Special issue]. *Prevention and Treatment*, 4, 1–62.
- Greenberg, M. T., Weissberg, R. P., & O'Brien, M. U. (2003). Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist*, 58(6–7), 466–474.
- Gregory, A., & Weinstein, R. S. (2004). Connection and regulation at home and in school: Predicting growth in achievement for adolescents. *Journal of Adolescent Research*, 19(4), 405–427.
- Grolnick, W. S., & Ryan, R.M. (1989). Parent styles associated with children's self-regulation and competence in school. *Journal of Educational Psychology*, 81(2), 143–154.
- Gunnar, M. R., Seban, A. M., & Tout, K. (2003). Peer rejection, temperament, and cortisol activity in preschoolers. *Developmental Psychobiology*, 43(4), 346–358.
- Gutman, L. M., & Sulzby, E. (2000). The role of autonomy-support versus control in the emergent writing behaviors of African-American kindergarten children. *Reading Research & Instruction*, 39(2), 170–183.
- Hamm, J. V., & Faircloth, B. S. (2005). Peer context of mathematics classroom belonging in early adolescence. *Journal of Early Adolescence*, 25(3), 345–366.
- Hampton, F., Mumford, D., & Bond, L. (1997). *Enhancing urban student achievement through family oriented school practices*.

- Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.
- Hamre, B. K., Justice, L., Pianta, R. C., Kilday, C., Sweeny, B., Downer, J., et al. (in press). Implementation fidelity of the MyTeachingPartner literacy and language activities: Associations with preschoolers' language and literacy growth. *Early Childhood Research Quarterly*.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development, 72*(2), 625-638.
- Hamre, B. K., & Pianta, R. C. (2005). Can instructional and emotional support in the first grade classroom make a difference for children at risk of school failure? *Child Development, 76*(5), 949-967.
- Hamre, B. K. & Pianta, R. C. (2007). Learning opportunities in preschool and early elementary classrooms. In R. C. Pianta, M. J. Cox, & K. Snow (Eds.), *School readiness and the transition to school* (pp. 49-84). Baltimore: Brookes.
- Hamre, B. K., Pianta, R. C., Mashburn, A. J., & Downer, J. T. (2009). *Measuring good teaching in early education: Testing the CLASS Framework in over 4,000 U.S. early childhood and elementary classrooms*. Manuscript submitted for publication.
- Han, S. S., & Weiss, B. (2005). Sustainability of teacher implementation of school-based mental health programs. *Journal of Abnormal Child Psychology, 33*(6), 665-679.
- Harter, S. (1996). Teacher and classmate influences on scholastic motivation, self-esteem, and level of voice in adolescents. In J. Juvonen & K. Wentzel (Eds.), *Social motivation: Understanding children's school adjustment* (pp. 11-42). New York: Cambridge University Press.
- Howes, C. (2000). Social-emotional classroom climate in child care, child-teacher relationships and children's second grade peer relations. *Social Development, 9*, 191-204.
- Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to learn? children's pre-academic achievement in pre-kindergarten programs. *Early Childhood Research Quarterly, 23*, 27-50.
- Howes, C., Hamilton, C. E., & Matheson, C. C. (1994). Children's relationships with peers: Differential associations with aspects of the teacher-child relationship. *Child Development, 65*, 253-263.
- Hughes, J. N., Cavell, T. A., & Willson, V. (2001). Further evidence for the developmental significance of teacher-student relationships: Peers' perceptions of support and conflict in teacher-student relationships. *Journal of School Psychology, 39*, 289-301.
- Illinois State Board of Education. (2004). Illinois learning standards—social/emotional learning (SEL). Retrieved from http://www.isbe.net/ils/social_emotional/standards.htm
- Inagaki, K., Morita, E., & Hatano, G. (1999). Teaching-learning of evaluative criteria for mathematical arguments through classroom discourse: A cross-national study. *Mathematical Thinking and Learning, 1*(2), 93-111.
- Kam, C., Greenberg, M. T., & Walls, C. T. (2003). Examining the role of implementation quality in school-based prevention using the PATHS curriculum. *Prevention Science, 4*(1), 55-63.
- Kellam, S. G., Ling, X., Merisca, R., Brown, C., & Ialongo, N. (1998). The effect of the level of aggression in the first grade classroom on the course and malleability of aggressive behavior into middle school. *Development and Psychopathology, 10*(2), 165-185.
- Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence? *Child Development, 70*, 1373-1400.
- Ladd, G. W., & Burgess, K. B. (1999). Charting the relationship trajectories of aggressive, withdrawn, and aggressive/withdrawn children during early grade school. *Child Development, 70*, 910-929.
- Ladd, G. W., Kochenderfer, B. J., & Coleman, C. C. (1997). Classroom peer acceptance, friendship, and victimization: Distinct relational systems that contribute uniquely to children's school adjustment? *Child Development, 68*, 1181-1197.
- Ladd, G. W., & Troop-Gordon, W. (2003). The role of chronic peer difficulties in the development of children's psychological adjustment problems. *Child Development, 74*, 1325-1348.
- La Paro, K. M., Hamre, B. K., Locasale-Crouch, J., Pianta, R. C., et al. (2009). Quality in kindergarten classrooms: Observational evidence for the need to increase children's learning opportunities in early education classrooms. *Early Education and Development, 20*, 657-692.
- Lerner, R. M. (1998). Theories of human development: Contemporary perspectives. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology (5th ed.): Theoretical models of human development* (pp. 1-24). New York: Wiley.
- Lynch, M., & Cicchetti, D. (1992). Maltreated children's reports of relatedness to their teachers. In R. C. Pianta (Ed.), *Relationships between children and non-parental adults: New directions in child development* (pp. 81-108). San Francisco, CA: Jossey-Bass.
- Many, J. E. (2002). An exhibition and analysis of verbal tapestries: Understanding how scaffolding is woven into the fabric of instructional conversations. *Reading Research Quarterly, 37*(4), 376-407.
- Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O., Bryant, D., et al. (2008). Pre-k program standards and children's development of academic, language, and social skills. *Child Development, 79*, 732-749.
- Mayer, R. E. (2002). Rote versus meaningful learning. *Theory into Practice, 41*, 226-233.
- Measelle, J., John, O., Ablow, J., Cowan, P., & Cowan, C. (2005). Can children provide coherent, stable, and valid self-reports on the big five dimensions? A longitudinal study from ages 5 to 7. *Journal of Personality & Social Psychology, 89*(1), 90-106.
- Midgley, C. (Ed.). (2002). Achievement goals and goal structures. *Goals, goal structures, and patterns of adaptive learning*. Mahwah, NJ: Erlbaum.
- Midgley, C., Maehr, M., Hicks, L., Roeser, R., Urdan, T., Anderman, E., et al. (1996). *Patterns of Adaptive Learning Survey (PALS)*. Ann Arbor: The University of Michigan.
- Moos, R. H., & Trickett, E. J. (1987). *Classroom environment scale manual* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.
- Morrison, F. J., & Connor, C. M. (2002). Understanding schooling effects on early literacy: A working research strategy. *Journal of School Psychology, 40*, 493-500.
- National Center for Education Statistics. (2003). *The condition of education 2003*. Washington, DC: U.S. Department of Education, Institute of Education Sciences.
- National Institute of Child Health and Human Development (NICHD), Early Child Care Research Network (ECCRN). (2002). The relation of global first-grade classroom environment to structural classroom features and teacher and student behaviors. *The Elementary School Journal, 102*(5), 367-387.
- National Institute of Child Health and Human Development (NICHD), Early Child Care Research Network (ECCRN). (2003a). The NICHD study of early child care: Contexts of development and developmental outcomes over the first seven years of life. In J. Brooks-Gunn, A.S. Fuligni, & L. J. Berlin (Eds.), *Early child development in the 21st century* (pp. 181-201). New York: Teachers College Press.
- National Institute of Child Health and Human Development (NICHD), Early Child Care Research Network (ECCRN). (2003b). Social functioning in first grade: Prediction from

- home, child care and concurrent school experience. *Child Development*, 74, 1639–1662.
- National Institute of Child Health and Human Development (NICHD), Early Child Care Research Network (ECCRN). (2005). A day in third grade: A large-scale study of classroom quality and teacher and student behavior. *The Elementary School Journal*, 105, 305–323.
- Nye, B., Konstantopoulos, S., & Hedges, L. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis*, 26, 237–257.
- Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist*, 36, 89–101.
- Patrick, H., Ryan, A. M., Anderman, L. H., Middleton, M., Linnenbrink, L., Hruda, L. Z., et al. (1997). *Manual for observing patterns of adaptive learning (OPAL): A protocol for classroom observations*. Ann Arbor, MI: University of Michigan.
- Pianta, R. C. (1999). *Enhancing relationships between children and teachers*. Washington, DC: American Psychological Association.
- Pianta, R. C. (2006). Schools, schooling, and developmental psychopathology. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and method* (pp. 494–529). Hoboken, NJ: Wiley.
- Pianta, R. C. & Allen, J. P. (2008). Building capacity for positive youth development in secondary school classrooms: Changing teachers' interactions with students. In M. Shinn & H. Yoshikawa (Eds.), *Toward positive youth development: transforming schools and community programs* (pp. 21–39). New York: Oxford University Press.
- Pianta, R. C., Belsky, J., Houts, R., Morrison, F., & NICHD ECCRN. (2007). Opportunities to learn in America's elementary classrooms. *Science*, 315, 1795–1796.
- Pianta, R. C., Hamre, B. K., Spekman, N. J., Mintz, S., & La Paro, K. M. (2006). *Classroom Assessment Scoring System [CLASS]—Secondary version*. Unpublished measure, University of Virginia.
- Pianta, R. C., La Paro, K., & Hamre, B. K. (2008). *Classroom Assessment Scoring System*. Baltimore, MD: Brookes.
- Pianta, R. C., La Paro, K. M., Payne, C., Cox, M. J., & Bradley, R. (2002). The relation of kindergarten classroom environment to teacher, family, and school characteristics and child outcomes. *Elementary School Journal*, 102(3), 225–238.
- Pianta, R. C., Steinberg, M. S., & Rollins, K. B. (1995). The first two years of school: Teacher-child relationships and deflections in children's classroom adjustment. *Development and Psychopathology*, 7, 295–312.
- Pressley, M., Gaskins, I. W., Solic, K., & Collins, S. (2006). A portrait of Benchmark School: How a school produces high achievement in students who previously failed. *Journal of Educational Psychology*, 98(2), 282–306.
- Pressley, M., Roehrig, A., Raphael, L., Dolezal, S., Bohn, K., Mohan, L., et al. (2003). Teaching processes in elementary and secondary education. In W. M. Reynolds & G. E. Miller (Eds.), *Comprehensive handbook of psychology: Vol. 7. Educational psychology* (pp. 153–175). New York: Wiley.
- Raver, C. C. (2004). Placing emotional self-regulation in socio-cultural and socioeconomic contexts. *Child Development*, 75(2), 346–353.
- Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing autonomy support. *Motivation & Emotion*, 28, 147–169.
- Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K., Harris, K. M., Jones, J., Tabor, J., et al. (1997). Protecting adolescents from harm: Findings from the National Longitudinal Study of Adolescent Health. *Journal of the American Medical Association*, 278, 823–832.
- Rimm-Kaufman, S. E., Early, D. M., & Cox, M. J. (2002). Early behavioral attributes and teachers' sensitivity as predictors of competent behavior in the kindergarten classroom. *Journal of Applied Developmental Psychology*, 23(4), 451–470.
- Roeser, R. W., Eccles, J. S., & Sameroff, A. J. (2000). School as a context of early adolescents' academic and social-emotional development: A summary of research findings. *The Elementary School Journal*, 100, 443–471.
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Rogoff, B. (2003). *The cultural nature of human development*. New York: Oxford University Press.
- Romberg, T. A., Carpenter, T. P., & Dremock, F. (2005). *Understanding mathematics and science matters*. Mahwah, NJ: Erlbaum.
- Rones, M., & Hoagwood, K. (2000). School-based mental health services: A research review. *Clinical Child and Family Psychology Review*, 3(4), 223–241.
- Rubin, K. H., Coplan, R. J., Fox, N. A., & Calkins, S. D. (1995). Emotionality, emotion regulation, and preschoolers' social adaptation. *Development and Psychopathology*, 7, 49–62.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68–78.
- Ryan, R. M., Stiller, J. D., & Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self-esteem. *Journal of Early Adolescence*, 14(2), 226–249.
- Saunders, W. M., & Goldenberg, C. (1999). Effects of instructional conversations and literature logs on limited- and fluent-English-proficient students' story comprehension and thematic understanding. *Elementary School Journal*, 99(4), 277–301.
- Silver, R. B., Measelle, J., Essex, M., & Armstrong, J. M. (2005). Trajectories of externalizing behavior problems in the classroom: Contributions of child characteristics, family characteristics, and the teacher-child relationship during the school transition. *Journal of School Psychology*, 43, 39–60.
- Skibbe, L., Behnke, M., & Justice, L. M. (2004). Parental scaffolding of children's phonological awareness skills: Interactions between mothers and their preschoolers with language difficulties. *Communication Disorders Quarterly*, 25(4), 189–203.
- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology*, 85, 571–581.
- Skinner, E. A., Zimmer-Gembeck, M. J., & Connell, J. P. (1998). Individual differences and the development of perceived control. *Monographs of the Society for Research in Child Development*, 63(2–3), v–220.
- Soar, R. S., & Soar, R. M. (1978) Emotional climate and management. In P. L. Peterson & H. J. Walberg (Eds.), *Research on teaching: Concepts, findings and implications* (pp. 97–119). Berkeley, CA: McCutchin.
- Stallings, J. (1975). Implementation and child effects of teaching practices in follow through classrooms. *Monographs of the Society for Research in Child Development*, 40 (7–8, Serial No. 163).
- Stallings, J., Cory, R., Fairweather, J., & Needels, M. (1978). *Early childhood education classroom evaluation*. Menlo Park, CA: SRI International.
- Stipek, D., & Byler, P. (2004). The early childhood classroom observation measure. *Early Childhood Research Quarterly*, 19(3), 375–397.
- Sutherland, K.S., Wehby, J. H., & Yoder, P. J. (2002). Examination of the relationship between teacher praise and opportunities for students with EBD to respond to academic requests. *Journal of Emotional and Behavioral Disorders*, 10(1), 5–13.
- Taylor, B. M., Pearson, P. D., Peterson, D. S., & Rodriguez, M. C. (2003). Reading growth in high-poverty classrooms: The

- influence of teacher practices that encourage cognitive engagement in literacy learning. *The Elementary School Journal*, 104, 3–28.
- Tingstrom, D., Sterling-Turner, H., & Wilczynski, S. (2006). The good behavior game: 1969–2002. *Behavior Modification*, 30(2), 225–253.
- Tobin, R. M., & Graziano, W. G. (2006). Development of regulatory processes through adolescence. In D. K. Mroczek & T. D. Little (Eds.), *Handbook of personality development* (pp. 263–283). Mahwah, NJ: Erlbaum.
- Tout, K., de Haan, M., Campbell, E., & Gunnar, M. (1998). Social behavior correlates of cortisol activity in child care: Gender differences and time-of-day effects. *Child Development*, 69(5), 1247–1262.
- Valente, T., Unger, J., Ritt-Olson, A., Cen, S., & Johnson, C. (2006). The interaction of curriculum type and implementation method on 1-year smoking outcomes in a school-based prevention program. *Health Education Research*, 21(3), 315–324.
- Valeski, T., & Stipek, D. (2001). Young children's feelings about school. *Child Development*, 72(4), 1198–1213.
- Van Ijzendoorn, M., & Bakermans-Kranenburg, M. (2004). Maternal sensitivity and infant temperament in the formation of attachment. In G. Bremner & A. Slater (Eds.), *Theories of infant development* (pp. 233–257). Malden, MA: Blackwell.
- Van Ijzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Some data from Holland and Israel. In R. E. Pianta (Ed.), *New directions in child development: Vol. 57. Relationships between children and non-parental adults* (pp. 5–24). San Francisco, CA: Jossey-Bass.
- Veenman, M. V. J., Kok, R., & Blöte, A. W. (2005). The relation between intellectual and metacognitive skills in early adolescence. *Instructional Science*, 33(3), 193–211.
- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Vygotsky, L. S. (1991). Genesis of the higher mental functions. In P. Light, S. Sheldon, & M. Woodhead (Eds.), *Learning to think* (pp. 32–41). Florence, KY: Routledge.
- Wentzel, K. R. (1999). Social-motivational processes and interpersonal relationships: Implications for understanding motivation at school. *Journal of Educational Psychology*, 91, 76–97.
- Wentzel, K. R. (2002). Are effective teachers like good parents? Teaching styles and student adjustment in early adolescence. *Child Development*, 73(1), 287–301.
- West, J., Denton, K., & Germino-Hausken, E. (2000). America's kindergartners: Findings from the early childhood longitudinal study, kindergarten class of 1998–99. *Education Statistics Quarterly*, 2(1), 7–13.
- Wharton-McDonald, R., Pressley, M., & Hampston, J. M. (1998). Literacy instruction in nine first-grade classrooms: Teacher characteristics and student achievement. *Elementary School Journal*, 99(2), 101–128.
- Wigfield, A., Eccles, J., MacIver, D., Reuman, D., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology*, 27(4), 552–565.
- Williams, W. M., Blythe, T., & White, N. (2002). Practical intelligence for school: Developing metacognitive sources of achievement in adolescence. *Developmental Review*, 22(2), 162–210.
- Yair, G. (2000). Educational battlefields in America: The tug-of-war over students' engagement with instruction. *Sociology of Education*, 73, 247–269.