UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

APPROACHES TO LEARNING: CONCEPTUALIZATION AND MEASUREMENT OF A KEY SCHOOL READINESS INDICATOR

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

BY

AMBER H. BEISLY
Norman, Oklahoma
2020

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APPROACHES TO LEARNING: CONCEPTUALIZATION AND MEASUREMENT OF A KEY SCHOOL READINESS INDICATOR

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF INSTRUCTIONAL LEADERSHIP AND ACADEMIC CURRICULUM

BY THE COMMITTEE CONSISTING OF:

Dr. Diane Horm, Chair

Dr. Libby Ethridge

Dr. Claudette Grinnell-Davis

Dr. Kyong-Ah Kwon

Dr. Vickie Lake

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DEDICATION

Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.

-Albert Einstein

This is dedicated to Ricardo, Colin, Dejon, Keymontee, Ella, and Yuri, who showed me the multiple ways to approach a task and whose solution was always more inventive than I had imagined. Although I was your teacher, you taught me so much about how to think, learn, and play.

And to Ellie, Carly, and Delaney, who can find over a hundred different ways to play with a CanCarrier.

Acknowledgments

A few years ago, *ahem, as a senior in college, I wrote a list of things I wanted to accomplish after graduation. Among them was “get a Ph.D.,” which I distinctly remember giggling at when I wrote it. It seemed like a dream so far removed as to not be possible. Hiking the Appalachian trail, another item on my wish list, seemed more possible because the steps necessary to do that seemed much more tangible.

Yet, here I am, 17 years later, completing my dissertation without hiking boots. Many people helped me go from a bold idea in the back of my mind to this writing. First, my parents, who constantly encouraged me, made sure I was doing alright and offered to help wherever it was needed. Dad, your advice to not sweat the small stuff, was ever present in the back of my mind as I tackled obstacles and setbacks along the way. Mom, your support made it possible for me to go back to school in the first place, and I am grateful for your willingness to watch Delaney so that I could go out and do the activities that “would help my CV.” I am also eternally grateful for the support and love I received from my grandparents, Papa Ed and Grandma Dot. Although you cannot be here to watch me defend my dissertation, I know that you are cheering me on.

I am so thankful for my daughters, who sacrificed time with their mom so that she could write papers, attend class, and work. Ellie, thank you for always listening to me practice my presentations, nodding at the correct times, even though you may not understand it. Carly, thank you for writing me secret notes of encouragement and telling me how much you love me. Delaney, thank you for helping me with my work and doing your own research alongside me.

Brian, love of my life, I remember the day when I told you that I wanted to quit teaching and go back to work. Without missing a beat, you said, “We will make it work.” And we have. You have been incredibly supportive whenever and exactly how I needed it—watching the children so I could sneak away to finish my papers, plying me with ice cream or coffee, listening to me give presentations or just talk about my research, and rearranging your schedule so that I could do what I needed to do. Thank you for everything you have done along the way so that I could pursue my dreams.

I would also like to thank the faculty at OU-Tulsa. You are five incredibly inspiring women. Each of you has shaped my journey in such important ways and taught me about much more than just how to write a dissertation:

Dr. Kwon, thank you for helping me develop my skills as a researcher. I learned so much from working with you about crafting research questions, finding the gap, and writing a good discussion section. You also encouraged me, with just a gentle nudge, to present at national conferences and meet the famous people in my field.

Dr. Lake, thank you for helping me learn to think more critically. I am so grateful for the times that I was able to ask you for advice or how to navigate situations and receive honest

answers. I am also thankful for the many ways in which you encourage me to develop my quantitative skills and push me to do more.

Dr. Ethridge, thank you for your constant care and concern. I was always appreciative of the many ways in which you check in on me and make sure I am doing okay. I have enjoyed learning about how to be a wonderful professor and how to find my voice. I have learned valuable lessons about how to advocate for myself, remain poised through tough times, and how to teach others about defending their principles.

Dr. Grinnell-Davis, thank you for your time. I learned much from our frequent meetings about statistics, data management, and data analysis. But, I also learned not to take a number at face value. I am incredibly grateful for your help and support along the way. You taught me how to dig through the data and weed out the garbage before just jumping in.

Dr. Horm, thank you for EVERYTHING! One of the things I appreciate most about you is that you always asked, “what can I do? What do you need?” You read through countless drafts, pushed my thinking about topics, and helped me flush out what I was really trying to say. Your flexibility to meet me wherever I needed was what I needed to get the job done. I also value your advice about how to present myself as a researcher and how to shape my career path. I really enjoyed listening to your stories and experiences.

I want to thank the Early Childhood Education Institute for the use of their data and their support in understanding and navigating the data along the way. Thank you to Shinyoung for your leadership style and encouragement of my own approaches to learning. You taught me so much about data management, statistics, analysis, and where to go to find the answers to my questions. Thank you to Dr. Castle for helping me understand the nuances of the data. Thank you for also being available at a moment’s notice to talk through the quirks in the data. Thank you also to the data collectors who worked tirelessly to collect and enter the data which I was able to seamlessly use.

I want to thank the OWLS. Knowing that I would see you every week and have to say something about my progress kept me motivated to keep working throughout the week. Thank you for listening to me talk through my research, challenging my findings, and reading through drafts of my papers.

And, I might be remiss without thanking Zeus and Apollo. Thank you for never eating my homework.

Brian, should we buy some hiking boots now?

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PROLOGUE

This dissertation adheres to a journal-ready format. Three journal articles prepared for submission to refereed journals comprise the first part of the dissertation. Manuscript I, The Jingle-Jangle of Approaches to Learning: A Construct With Too Many Names, is prepared for the journal *Review of Educational Research*. Manuscript II, Exploration and Dramatizing: Theoretical Foundations for the Development of Approaches to Learning through play is prepared for the journal, *American Journal of Play.* Manuscript III, Profiles of Adaptive Magic: Children's Approaches to Learning is prepared for the journal, *Early Education and Development.*

Dissertation Abstract

Often cited as a key school readiness indicator, Approaches to Learning (AtL) includes a wide variety of dispositions, behaviors, and characteristics such as curiosity, initiative, cooperation, attention, persistence, and frustration tolerance. Children with AtL may interact more positively with teachers or may be able to sustain attention and focus during interactions, which increases the likelihood that they will learn from these interactions. Nevertheless, the construct of AtL suffers from a lack of conceptual and measurement clarity related to its use as an umbrella construct. The aims of this study were to explore measurement issues related to AtL, examine how play supports the development of AtL, and to investigate profiles of AtL among a group of children. Considering this, a careful review of the literature related to AtL was presented, including the ways in which the construct has been termed, operationalized, and measured. Using a newly designed conceptual framework, studied were re-examined to understand measurement issues related to AtL. Next, classroom implications for the construct of AtL were explored using two kinds of play, exploration and dramatization. Vygotsky's work regarding young children's working theories and symbolic representation was discussed as well as ways in which teachers can use curriculum to amplify children's initiative, curiosity, and flexibility. While play-based curricula support children's AtL development, more work is needed to understand how individual children develop AtL in the classroom. To that end, Latent Profile Analysis was presented examining profiles of AtL using a sample of Head Start Children. Results from the study revealed five unique profiles, including positive, negative, and low AtL, lending support to the idea that children develop AtL through multiple pathways.

Keywords: approaches to learning, school readiness, play, latent profile analysis

MANUSCRIPT I

The Jingle-Jangle of Approaches to Learning:

A Construct With Too Many Names

This manuscript is prepared for submission to the peer-reviewed journal *Review of Educational Research* and is the first of three manuscripts prepared for a journal-ready doctoral dissertation.

Abstract

Approaches to Learning (AtL) is an umbrella construct describing the attitudes, habits, and learning styles of children as they engage in the learning process. First introduced by the National Education Goals Panel as an indicator of school readiness, AtL includes openness to new tasks, initiative, task persistence, and imagination. Over the years, this construct has been studied in a wide variety of ways, leading to inconsistences in terms, operationalizations, and measurements. This paper examined the issues surrounding the inconsistences in previous research and offered a new conceptualization of the construct. One area of consistencies included the expansive set of characteristics attributed to the construct of AtL, resulting in a jingle fallacy. Another area of inconsistency occurred when researchers used different terms to describe similar constructs, resulting in a jangle fallacy. In this case, adjustment, behavioral engagement, and classroom participation were reported as separate constructs in the literature yet were measured using AtL measurements. The paper concluded by offering ways to reduce the conceptual clutter surrounding AtL.

Keywords: jingle fallacy, jangle fallacy, conceptualization, measurement, Approaches to Learning,

The Jingle-Jangle of Approaches to Learning: A Construct With Too Many Names

Approaches to Learning (AtL) was first introduced in the early 1990s as a critical component of school readiness describing how children respond to learning situations (Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Kagan, Moore, & Bredekamp, 1995). At the time, the National Education Goals Panel (NEGP) described AtL as "the least understood, least researched, and most important dimension" (1995, p. 28). Although there has been continued interest in AtL, underlying conceptual frameworks have not kept pace (Cerda, Im, & Hughes, 2014). To date, the field lacks consensus on a uniform definition of AtL and a conceptual framework for how it is distinct from other constructs like self-regulation or engagement (Hyson, 2008).

In some ways, the difficulties surrounding the conceptualization of AtL mirror the struggle to adequately define and conceptualize children's social, emotional, and cognitive skills more generally (Farran, 2011). Currently, there is not a clear conceptual background distinguishing social and emotional development from other broad domains or that includes carefully delineated and defined subdomains, constructs, and corresponding behaviors (Jones, Zaslow, Darling-Churchill, & Halle, 2016). Without this, there is no distinct boundary of social and emotional development or a way to separate it from other domains. It is also unknown which constructs within the domain are most salient during particular stages of development (Halle & Darling-Churchill, 2016). Across studies, the same item or subscale may be used to capture multiple domains of social and emotional development resulting in conceptual clutter (Jones et al., 2016). As a result, umbrella constructs like self-regulation suffer from the *jingle fallacy* when a single term is used to describe a wide variety of skills (Borghans, Duckworth, Heckman, & Ter Weel, 2008; Reeves, Venator, & Howard, 2014). In this case, self-regulation appears to lead to

similar outcomes across studies but has been defined and measured inconsistently. It becomes difficult to disentangle subdomains and distinguish the specific behaviors associated with given outcomes.

Another issue occurs when multiple terms are employed to study the same construct, which is called the jangle fallacy (Jones et al., 2016). A particular attribute may be described as a skill, a personality trait, a characteristic, or a disposition, often depending upon the researcher's field (Reeves & Venator, 2014). For example, "non-cognitive factors," i.e., domain-general skills or attributes, have been described using many different terms, such as social and emotional learning, 21st century skills, soft skills, academic mindsets, character, and deeper learning (Jones, Bailey, Brush, Nelson, & Barnes, 2016). With multiple names for similar constructs, it becomes difficult to determine the links or similarities across various studies.

Similarly, for AtL, there is no definitive conceptualization nor consensus in the field about a framework (Carter, Briggs-Gowan, & Davis, 2004; Halle & Darling-Churchill, 2016). Across studies, AtL is also known as executive function, self-regulation, learning dispositions, learning behaviors, learning-related behaviors, or approaches to learning (Farran, 2011). Each term has a corresponding definition and operationalization of skills drawn from social, emotional, and cognitive domains. Even within one domain of development, the skills may not be similar, with one study emphasizing attention and another emphasizing goal orientation and planning. In many cases, it is difficult to distinguish the researchers' use of the term AtL from other constructs like executive function, engagement, or behavioral self-regulation (i.e., Halliday, Calkins, & Leerkes, 2018; Hooper, Roberts, Sideris, Burchinal, & Zeisel, 2010). To counteract these discrepancies, Chen and McNamee (2011) report, "while the field may never be able to generate a definitive list of learning approaches, there is a consensus that initial engagement,

attention, planfulness, and goal orientation are among the most important positive approaches to learning" (p. 72). However, an examination of the definitions and operationalizations of AtL in recent studies reveals this is certainly not the case.

The issues of conceptualization and measurement are tightly linked. As Jones et al. (2016) point out, "if measurement drives what matters, we may miss the mark because of the definition clutter and misalignment that currently characterizes the field" (p. 43). To get rid of this conceptual clutter, we must carefully examine the construct of AtL. To better understand what we are measuring, we must have a conceptual framework defining AtL and distinguishing it from other related constructs (Halliday et al., 2018). The purpose of this paper is three-fold:

1. To clearly outline the definitional and measurement issues present in the AtL research,
2. To present a conceptual framework of AtL that overcomes many of the current issues, and
3. To examine, using this framework**,** how various research studies and measures align with this conceptualization.

Analysis of the Research

A detailed review of 42 studies was conducted to understand previous definitions and measurements of AtL as a school readiness construct. Studies were selected whose primary focus was AtL as a central study variable. Studies were limited to those conducted within the past twenty years and published in a peer-reviewed journal. Literature searches were conducted using Google Scholar, ERIC, and PsychInfo, using the search term "approaches to learning" and limiting results to the preschool age group.

The initial query produced over 150 results across search engines. The primary focus was on the quantitative measurement of AtL, so qualitative and intervention studies were removed. Over 25 studies used the publicly available Early Childhood Longitudinal Study-Kindergarten (ECLS-K) dataset and the Approaches to Learning Scale in that dataset. These were noted but not included in this analysis because AtL was not the focus of the study or because the researchers did not define or operationalize AtL. Similarly, although to a lesser extent, five studies used the Learning Behavior Scale or Preschool Learning Behaviors Scale. These five studies were not included for reasons similar to those applied to the ECLS-K studies. There were also cases where the same authors used the same measurement across multiple studies; these are not included in the table but are listed as footnotes. This process resulted in a final total of 42 studies. These results were compiled into a master list (see Appendix A).

After the list of studies was generated, the literature and methods sections were reviewed for the definition, operationalization, and measurement instrument used. The exact term the researchers used for AtL was noted in the table, as was how they described the construct. The measure and the subscale descriptions were also included. In order to best conceptualize the construct of AtL and differences across studies, charts were created that mapped operationalizations of AtL across social, emotional, behavioral, and cognitive developmental domains.

Finally, the measures were examined for similarities across studies. Particular areas of mismatch were detailed. Misalignment between the operationalization and measurement of AtL was first noted when researchers operationalized AtL to include aspects of a specific area of development but did not measure it in their study. Mismatch was also noted when researchers used the NEGP's operationalization of AtL and then used a measure that did not include all

aspects of the definition. Second, misalignment between conceptualizations was documented, as when the term approaches to learning was measured using various measures. Finally, misalignment across measures was logged, e.g., when studies used the same assessment but a different term to describe what was being measured.

Inconsistency of Term and Operationalization of Approaches to Learning

Across the 42 studies, there is wide variation in the use and the operationalization of the term Approaches to Learning. Kagan et al. (1995) describe AtL at the core of social/emotional and cognitive interactions, which may account for why it has been defined and operationalized differently across studies. Many studies use elements from these domains; however, given that AtL encompasses how children learn in the classroom, many of the terms and operationalizations also include behavioral aspects. Nonetheless, this wide variation and inconsistency across studies highlight the need for a more precise conceptual framework.

NEGP's Definition of Approaches to Learning

AtL has been described as a set of domain-general skills (Bustamante, White, & Greenfield, 2017; McDermott, Rikoon, & Fantuzzo, 2014). As such, AtL explains *how* children learn, rather than how well they learn (Razza, Martin, & Brooks-Gunn, 2015). The NEGP described AtL as an umbrella term covering "a range of attitudes, habits and learning styles" (Kagan et al., 1995, p. 23). AtL represents children's disposition or willingness to engage in the learning process. In summarizing AtL, Kagan describes it as the scaffolding frame of a child's entire being, highlighting its importance and foundational role in developing children's learning and approach to school.

In their description of AtL, the NEGP included the following: openness to and curiosity about new tasks and challenges; initiative, task persistence, and attentiveness; approach to

reflection and interpretation; capacity for invention and imagination; and cognitive approaches to tasks (Kagan et al., 1995, p. 23). Children's openness and curiosity drive knowledge acquisition and exploration of the unknown. Curiosity aids children to explore or manipulate objects, while initiative encourages children to ask questions about their investigations or try out difficult tasks. Task persistence helps support children's ability to follow through on plans. While playing with blocks, for example, children may seek to create a tall structure, which will require them to rebuild when blocks fall continually. They must also remain attentive to building structures amid possible distractions, like peers who want to develop different structures or a different set of toys. Reflection and interpretation include problem-solving, the ability to understand what is happening, what went wrong, and ways to fix the issue. Kagan et al. highlight the importance of imagination and invention to children's learning because the ability to create, combine new ideas, or push past more traditional ways of thinking are often tempered by cultural and school influences. Kagan's final category is cognitive approaches to tasks, which includes how children process information (orally, visually, etc.).

Inconsistency of Term Use

As evident in Appendix A, many of the 42 studies used the term Approaches to Learning, although this was not consistent. There were 17 different terms for AtL reflecting how AtL may be categorized as a behavior, skill, or disposition. Other terms were broader, e.g., Doctoroff, Fisher, Burrows, and Edman's (2016) term, global interest. Finally, other studies have used the term engagement—either school or classroom engagement. These terms could encompass behaviors, strategies, or internal drives that encourage children to go about learning in the classroom.

Many studies described AtL as a behavior, either a learning-related behavior or behavioral engagement (Abenavoli, Greenberg, & Bierman, 2017; Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009). These behaviors were adaptive (Sandilos, Whittaker, Vitiello, & Kinzie, 2019; Sasser, Bierman, & Heinrichs, 2015; Vitiello, Greenfield, Munis, & George, 2011) or learning-related (Sung & Wickrama, 2018). Others characterized it as a capacity (Bierman, Torres, Domitrovich, Welsh, & Gest, 2009) or skill (Bustamante et al., 2017). Daniels (2014) described it as an affective orientation, which is similar to Halliday et al.'s (2018) depiction of AtL as the behavioral, cognitive, and emotional result of internal drives. Finally, other characterizations include dispositions (McCoy, Connors, Morris, Yoshikawa, & Friedman-Krauss, 2015; Sung & Wickrama, 2018; Vitiello & Greenfield, 2017). This term highlights AtL's capacity to be learned or changed.

Inconsistency Across Operationalization

In the studies selected for this review, there is a wide range of over 75 attributes listed for AtL (See Table 1). Twelve researchers used a definition closely aligned with the NEGP. Barbu, Yaden, Levine-Donnerstein, and Marx (2015), Hair et al. (2006), and Bulotsky-Shearer, Fernandez, Dominguez, and Rouse (2011) used problem-solving skills instead of openness to reflection and interpretation. Other researchers added aspects to this definition or only focused on a few of the dimensions. Across studies, Bustamente combined aspects of peer interaction (i.e., 2018, 2019), and similarly, Daniels (2014) added interpersonal responsiveness. Meng (2015) only included initiative, engagement, and persistence, while Reid, Diperna, Missall, and Volpe (2014) included openness, task persistence, and imagination. Robinson (2013) included selecting challenging tasks (initiative), exerting intense effort (persistence), and concentration (attention). Vitiello et al. (2011) added motivation and positive disposition towards learning to

persistence and frustration tolerance, while Chen and McNamee (2011) included goal orientation. Across studies, these operationalizations of AtL emphasize aspects of initiative, persistence, problem-solving, and creativity.

Other operationalizations highlight the specific set of skills or behaviors researchers believe are linked with learning (see Table 2). Some emphasize social skills by describing AtL as the ability to get along with others (Ansari & Gershoff, 2015). Both McClelland, Morrison, Acock, and Morrison (2006) and Cerda et al. (2014) include social competence as aspects of AtL. Across multiple studies, Bustamente highlights the social component of AtL through engagement in group learning (2017), working collaboratively with adults or peers (2018), or communication/collaboration (2019). Finally, McCoy et al. (2015) describe it as positive social interaction skills. The inclusion of this social domain in AtL may be particularly relevant for the preschool age group because of the highly social nature of learning in typical classrooms (McClelland et al., 2006). Children frequently rely on social skills to manage conflicts, cooperate with their peers, and negotiate how to play (Bornstein, Hahn, & Haynes, 2010). These similar skills can also help support children's learning by facilitating participation in group settings (Barbu et al., 2015).

Other researchers have highlighted the cognitive aspects of AtL, excluding the social elements entirely. Brock et al. (2009) describe AtL as behavior that enables children to focus on a task without interruption, while Bierman et al. (2009) operationalize it as the capacity to approach learning tasks with focused interest and sustained engagement. Elliot (2019) highlights children's abilities to remain focused and engaged through specific behaviors like paying attention. Curiously, Hunter, Bierman, and Hall (2018) depict AtL as skills that enable children to engage in learning, including executive function (EF) specifically. Ursache, Blair, and Raver

(2012) argue that AtL relies on EF skills, like working memory, and effortful control, the ability to control reactivity. Sasser et al. (2015) describe AtL as a "proximal gateway to classroom learning," which is distinct but interrelated to executive function as an index of self- regulation (pg. 71). For example, EF helps support children's ability to stay on task when engaged in learning opportunities (Neuenschwander, Röthlisberger, Cimeli, & Roebers, 2012).

Table 1

Operationalizations of Approaches to Learning

Ability to maintain and focus attention	Focused interest	Peer collaboration
Accomplishment of tasks in a limited period of time	Following directions	Peer communication
Affective orientation	Following teacher directions	Persistence
Attention	Frustration tolerance	Planfulness
Attention during instructions	Goal orientation	Planning
Attention Regulation	Imagination	Positive disposition towards learning
Attentiveness	Independence	Positive Social Interaction Skills
Behavioral self-regulation	Independent pursuit of learning activities	Preference for challenge
Behavioral Disposition toward learning	Initiative	Problem-solving skills/Problem Solving
Cognitive learning style	Interpersonal responsiveness	Prosocial skills
Completing tasks when asked	Inventiveness	Reasoning
Completion of learning activities	Involvement in sequential learning behaviors and social-learning interactions	Responsibility
Compliance	Learning Behavior	Rule adherence
Contribution of questions or observations at appropriate times	Learning Independence	Selecting challenging tasks
Cooperating with other students	Level of participation in learning activities	Self-control
Curiosity	Listening to instructions	Self-direction
Eagerness	Listening to the teacher	Self-regulation
Emotion Regulation	Motivation	Sitting still
Engagement in group learning	On-task behavior	Social competence
Engagement with new activities	Openness to new and challenging experiences	Staying on task
Engagement/sustained engagement	Openness to tasks and challenges	Sustained focus
Enthusiasm in learning situations	Organization	Task focuses
Executive function	Orientation of attention to learning	Task persistence
Exerting intense effort and concentration	Participating in groups	Working collaboratively with adults or peers
Flexibility	Paying attention to the teacher	Working independently

The cognitive component of AtL includes children's attention and engagement during learning opportunities (Brock et al., 2009).

A final aspect of AtL mentioned across multiple studies is a behavioral dimension, such as self-regulation (Elliott, 2019; Hunter et al., 2018), regulatory behaviors (Berthelsen, Hayes, White, & Williams, 2017), self-direction (Vitiello & Greenfield, 2017), or self-control (Bumgarner, Martin, & Brooks-Gunn, 2013; Tan & Dobbs-Oates, 2013). DiPerna, Lei, and Reid (2007) emphasize following teacher directions, while Halliday et al. (2018) describe AtL as rule adherence, Razza et al. as compliance and Elliot (2019) as completing tasks when asked. Sasser et al. (2015) defined AtL as an adaptive response to the classroom demands and school learning tasks, which includes items such as following teacher directions, abiding by classroom rules and routines, and engaging in learning tasks. Specific behaviors may consist of staying on

Table 2

Operationalizations of AtL Across Primary Domains

Social	Behavioral	Cognitive	NEGP
Ansari & Gershoff (2015) Bustamente et al. (2017) McClellend et al. (2006)	Berthelsen et al. (2017) Bumgarner et al. (2013) DiPerna et al. (2007) Elliot (2019) Halliday et al. (2018) Hunter et al. (2018) Neuenschwander et al. (2012) Stipek et al. (2010)	Bierman et al. (2008) Brock et al. (2009) Hunter et al. (2018)	Barbu et al. (2015) Bulotsky-Shearer et al. (2011) Bustamente et al. (2017) Daniels (2014) Doctoroff et al. (2016) George and Greenfield (2005) Hair et al. (2006) Meng (2015) Reid et al. (2014) Robinson (2013) Vitiello et al (2011) Chen and McNamee (2011)

task, listening to the teacher, or following the teachers' directions (DiPerna et al., 2007; Neuenschwander et al., 2012). Others include sitting still and working independently (Stipek, Newton, & Chudgar, 2010; Tan & Dobbs-Oates, 2013). Brock et al. (2009) describe learning-related behavior as behavior that relies on the mental representation of rules. For these researchers, including this behavioral component of AtL emphasizes that good behavior is essential to learning.

Examination of the terms and operationalizations across the studies selected indicates a wide range and variety in both the name and operationalization. While the NEGP reported an initial set of six characteristics, research has expanded to include many more. These operationalizations include aspects of social, emotional, cognitive, and behavioral development, although it is not consistent across studies which elements from which domains are included in AtL. Given these inconsistencies, it is essential to consider how to conceptualize AtL in a way that captures multiple domains. And, given this wide variety, how does one measure across these domains?

A New Conceptualization of Approaches to Learning

Seventy-five different operationalizations of AtL were noted in the literature covering a wide range of behaviors across the social, cognitive, emotional, and behavioral domains. While McDermott et al. (2018) describe AtL as including aspects from the social, emotional, and cognitive domains, not all operationalizations could be neatly categorized this way. To understand how AtL can be conceptualized, the 75 characteristics of AtL have been mapped onto two separate sets of axes that encompass the social, emotional, behavioral, and cognitive domains (Figure 1). This conceptualization helps capture the wide variety of attributes and characteristics previously used to describe AtL, while also providing a way to capture AtL better.

For example, these axes create quadrants such that attributes of AtL can be classified as high in cognitive/low in the emotional domain or high in social/high in the behavioral domain.

The first set of axes developed contained emotional and cognitive domains, as these domains have been previously linked theoretically. Blair and Raver (2015) propose a neurological link between emotional and cognitive development, more specifically attention, in their psychobiological model of self-regulation. In this model, emotion and attention reciprocally influence each other in support of self-regulation (Blair, 2002). For example, attention helps regulate levels of emotional arousal by attending to cues or ignoring distractions. At the same time, when emotion regulation is too difficult, children may lose the ability to focus on the task at hand. While Blair's (2002) model describes self-regulation, the connection between emotion and cognition holds for AtL as well.

While the cognitive/emotional axes were able to describe many of the operationalizations of AtL, they did not capture everything. Therefore, an additional set of axes, social/behavioral

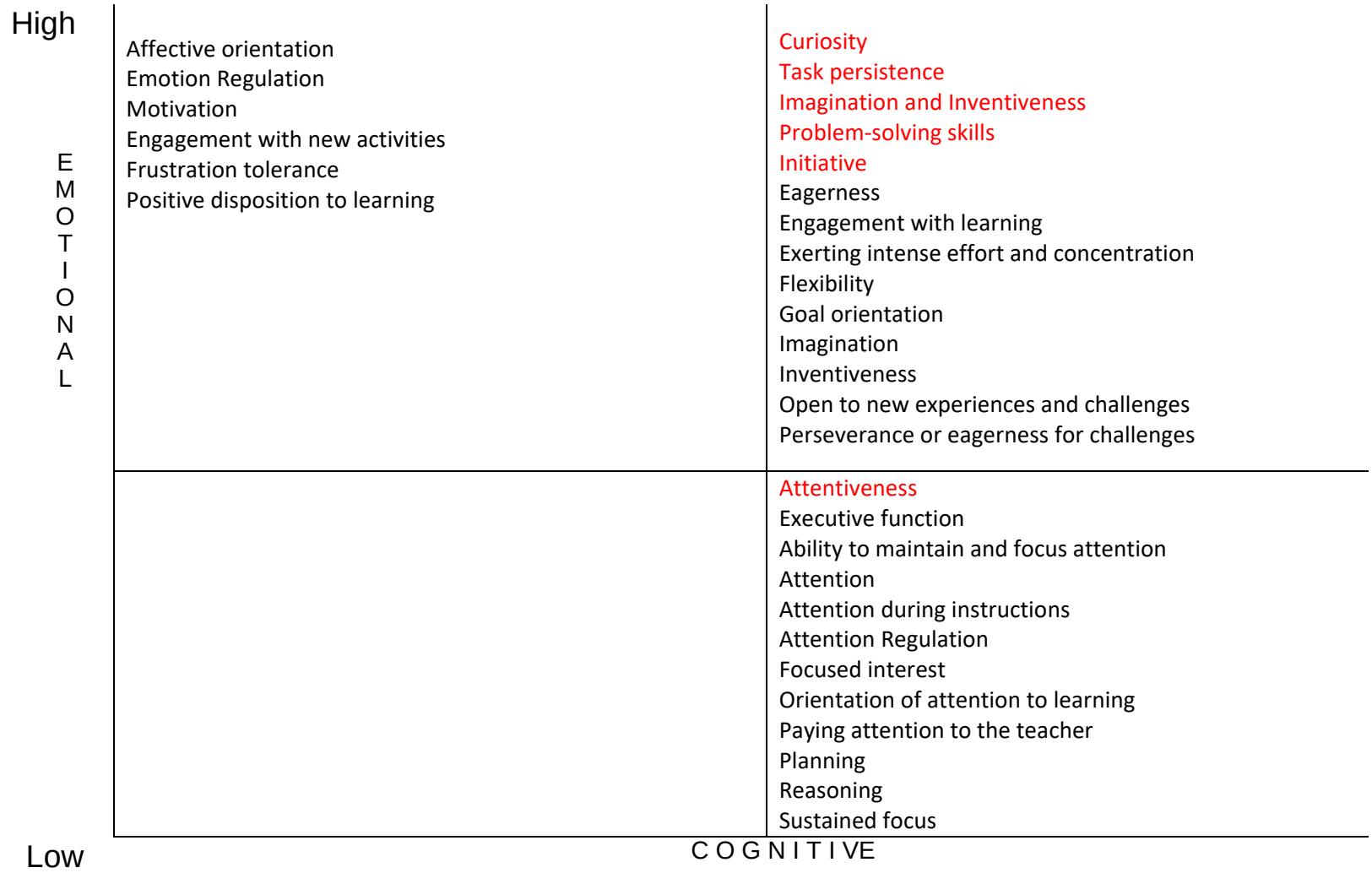


Figure 1

Mapping of the previous research conceptualizations of AtL

Note: Red=National Educational Goals Panel's original definition.

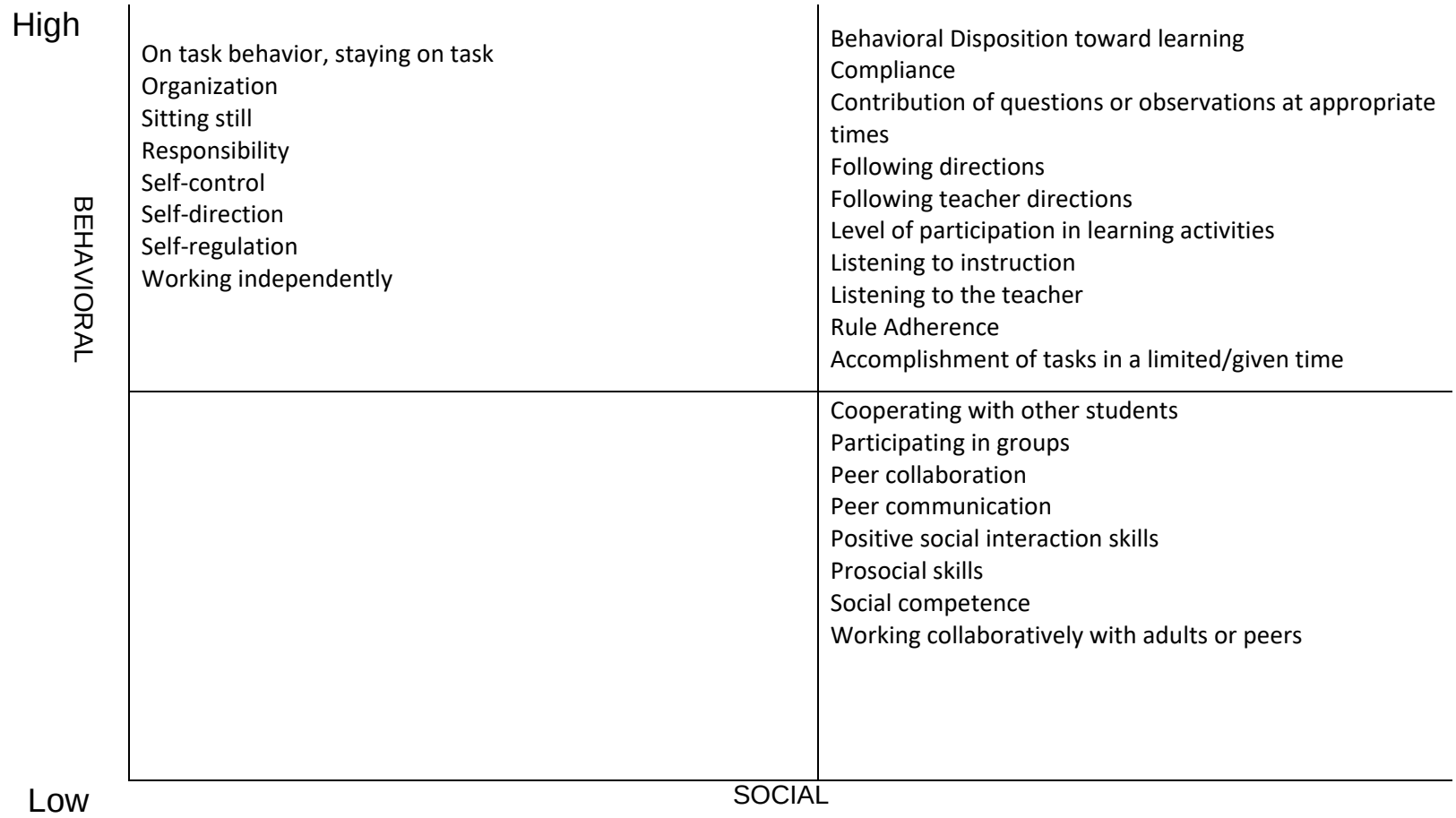


Figure 1 cont.

were created. Connecting the social and behavioral domains has been supported by previous literature linking children's social and behavioral competence (Bornstein et al., 2010; Coolahan, Fantuzzo, Mendez, & McDermott, 2000; McClelland & Morrison, 2003). For example, McClelland et al. (2006) include behavioral aspects when they define social competence as responsibility, independence, and cooperation. Positive social development includes children's ability to relate to teachers and peers and cooperate in the classroom and may help children attend to and internalize classroom rules (Stipek et al., 2010).

As evident in Figure 1, five of the NEGP's original indicators of AtL map onto the high cognitive/high emotional domain, the exception is attention/focus. This consistency offers insight into how the NEGP may have conceptualized AtL as the intersection of cognitive and emotional development. While this mapping underscores the multiple ways the construct has been operationalized across studies, it also highlights how AtL is similar to other constructs. For example, aspects of AtL seen in the behavioral/social axes may overlap with social competence and classroom behavior. Behaviors in the high emotion/low cognitive quadrant may better reflect effortful control or emotion regulation and not AtL. Future researchers could examine how their conceptualization of AtL maps onto these developmental domains to provide greater consistency.

Overall, this conceptualization of AtL demonstrates the discrepancies in the operationalization of AtL across the 42 studies. Many studies do not map onto the original NEGP's operationalization of AtL, and there is wide variation within quadrants of terms used. Even the large number of attributes across multiple domains sheds light on the potential for this construct to be too wide-reaching. This conceptualization is also useful for examining how measurements map onto the framework. As we will see, there are times when operationalization conflicts with measurement, and when measurements are not consistently used to assess AtL.

The Jingle Issue: Areas of Misalignment across Operationalization and Measurement

An umbrella term refers to a general concept that covers a broad scope. While umbrella terms may be useful for capturing a multitude of behaviors, one of the potential dangers is the construct covers too wide a range to be conceptually meaningful. This over-stretching is considered a jingle fallacy (Borghans et al., 2008). The operationalization of AtL presents such a jingle fallacy, with behaviors, dispositions, and characteristics that span across social, behavioral, cognitive, and emotional domains. A jingle fallacy can also occur when a construct is measured in a variety of dissimilar ways. Here, each assessment, although different, is measuring the same construct, but only because the construct has the same name across studies. Indeed, the various ways AtL has been measured and the inconsistency in the measurement and operationalization of AtL represent a jingle fallacy.

A review of the studies showed that while each study had a distinct operationalization of the term AtL, there were some commonalities in measurement. Fourteen different measures of AtL were present across studies, representing teacher report, direct assessment, and observation. Teacher-rated AtL measurements included published measurements specifically for AtL—the ECLS-K Approaches to Learning scale (ECLS-K scale) and the Preschool Learning Behaviors Scale (PLBS). Other measures were published measures of something else not specifically AtL, i.e., the School Readiness Questionnaire (SRQ), the Teacher Rating Scale of School Adjustment (TRSSA), the Social Skills Rating Scale (SSRS), the Learning to Learn Scale, the Devereaux Early Childhood Assessment (DECA) the Mock Report Card, and the Cooper-Farran Behavioral Rating Scale. Three different studies used researcher-created measures of AtL (Barbu et al., 2015; McCoy et al., 2015; Neuenschwander et al., 2012). Many studies used the ECLS-K (12

included in this study, but 25 included in the original scan), while many also used the PLBS. Three studies used various observation-based measures, including the Child Observation of Preschool (Nesbitt, Farran, & Fuhs, 2015), the inCLASS (Vitiello & Greenfield, 2017), and the Observed Child Engagement Scale (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Cerda et al. (2014) directly assessed effortful control, one aspect of AtL, through various inhibitory control tasks. George and Greenfield (2005) measured AtL through a problem-solving task.

For each of the five measures (DECA, SRQ, SSRS, ECLS-K, and the PLBS), that provided enough item-level information for analysis, the items were mapped onto the conceptual framework and examined (see Figure 2). In this way, it was possible to see whether there was alignment across operationalization and measurement. For example, the DECA was highest in descriptors in the high social/low behavior quadrant and the high emotional/low cognitive quadrant. However, Barbu et al.'s (2015) operationalization of AtL (using the NEGP) lies mostly in the high cognitive, high emotional quadrant, indicating the DECA may not be a valid measure of AtL according to the NEGP's definition. Similarly, George and Greenfield (2005) used the SSRS, which was highest in the high social/low behavior and the high social/high behavioral quadrant. However, their operationalization included terms like "curiosity, persistence, flexibility, inventiveness, engagement with new activities, and preference for challenge," which lies mostly in the high cognitive/high emotion quadrant (George & Greenfield, 2005, p. 70).

There were several misalignments between the operationalization and measurement approaches. There were at least four different studies that operationalized AtL according to the original NEGP description of AtL (initiative, curiosity, engagement and persistence, and reasoning and problem-solving skills). However, each one used a separate measurement of AtL

(see Table 3). Two studies used measures specifically designed to measure AtL (ECLS-K and PLBS). Others included the Teacher Rating Scales of Early Academic Competence, a "strength-based measure intended to screen a wide array of skills, behaviors, and attitudes indicative of school success" (Reid et al., 2014, p. 539). The academic enablers subscale of this measure is not explicitly designed to measure AtL; instead, it focuses on engagement, motivation, self-regulation, motor, interpersonal, and emotional competence. Finally, the DECA has been used in numerous studies as a measure of children's protective factors (De Feyter & Winsler, 2009; LeBuffe & Shapiro, 2004; Maier, Vitiello, & Greenfield, 2012).

Table 3

Studies using NEGP definition of AtL

Study	Description	Measurement
Barbu et al. (2015)	initiative, curiosity, engagement, persistence, reasoning, and problem-solving skills	DECA
Bulotsky-Shearer et al. (2011)	Initiative and curiosity, engagement and persistence, and reasoning and problem-solving skills	PLBS
Hair et al. (2006)	openness and curiosity to tasks and challenges, task persistence, imagination, attentiveness, and cognitive learning style	ECLS-K AtL Scale
Reid et al. (2014)	openness and curiosity about new tasks, task persistence, and imagination	Teacher Rating Scales of Early Academic Competence

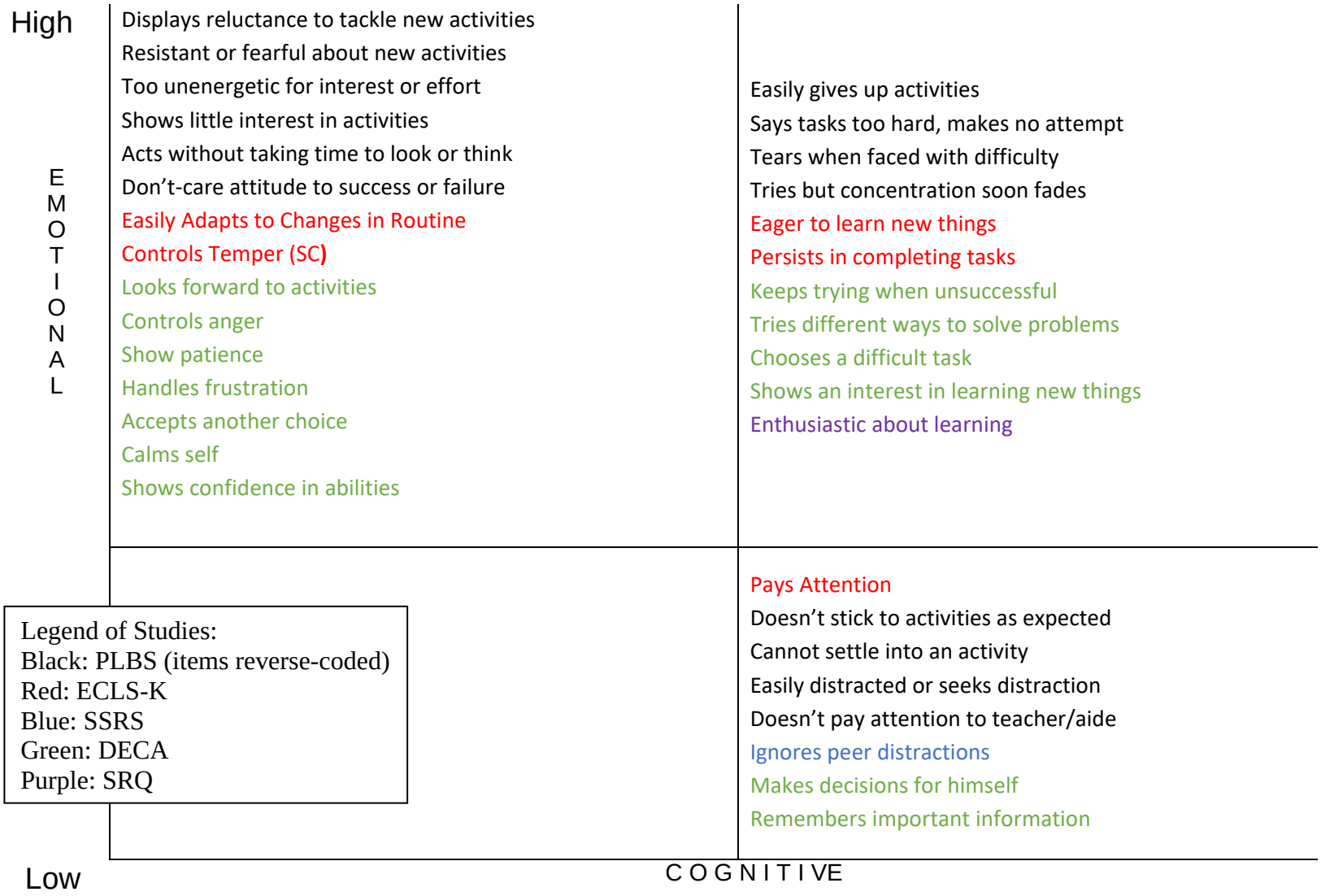
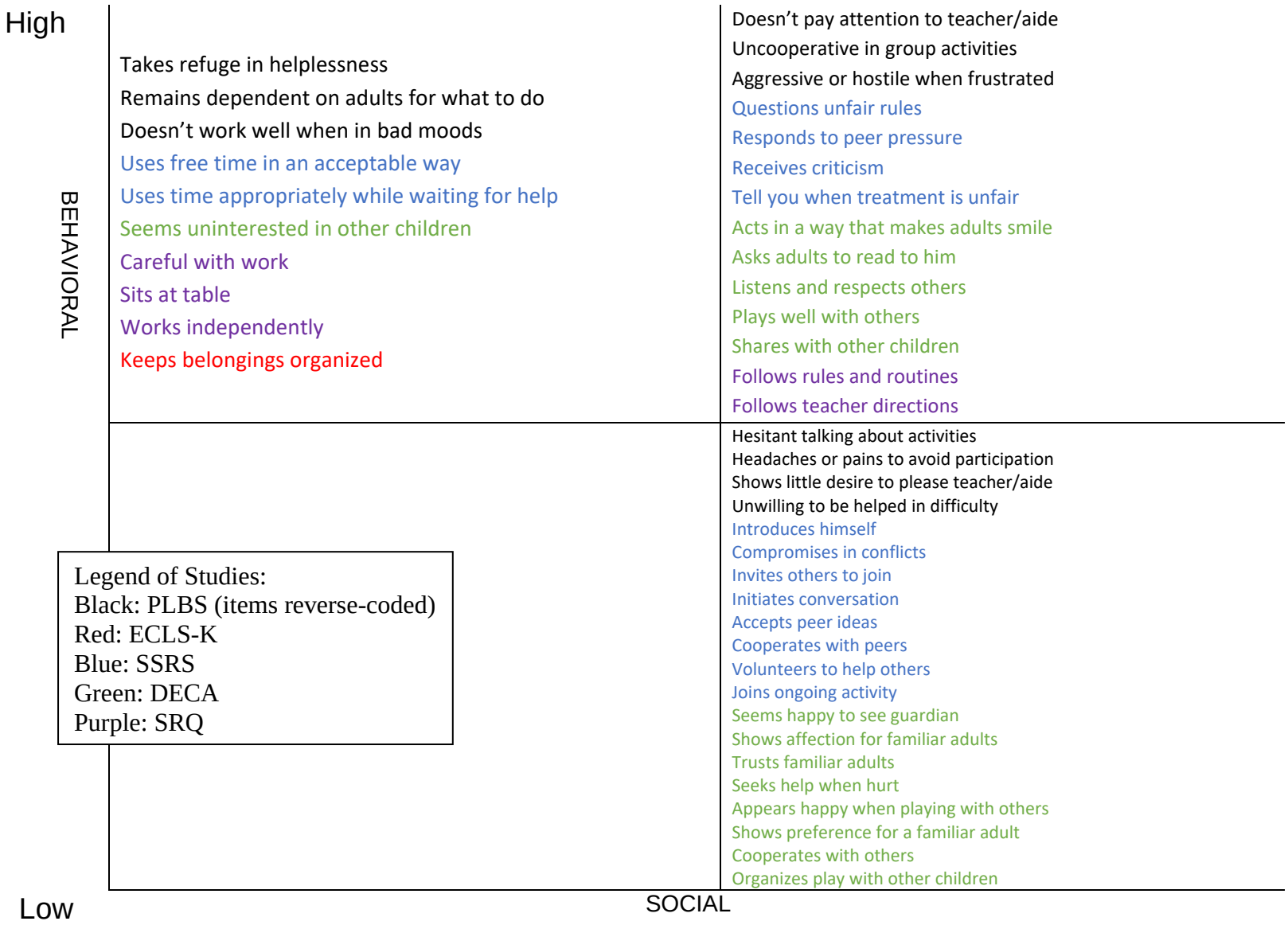


Figure 2

Mapping of the AtL Operationalizations by Assessment


High
BEHAVIORAL
Takes refuge in helplessness
Remains dependent on adults for what to do
Doesn't work well when in bad moods
Uses free time in an acceptable way
Uses time appropriately while waiting for help
Seems uninterested in other children
Careful with work
Sits at table
Works independently
Keeps belongings organized
Doesn't pay attention to teacher/aide
Uncooperative in group activities
Aggressive or hostile when frustrated
Questions unfair rules
Responds to peer pressure
Receives criticism
Tell you when treatment is unfair
Acts in a way that makes adults smile
Asks adults to read to him
Listens and respects others
Plays well with others
Shares with other children
Follows rules and routines
Follows teacher directions
Hesitant talking about activities
Headaches or pains to avoid participation
Shows little desire to please teacher/aide
Unwilling to be helped in difficulty
Introduces himself
Compromises in conflicts
Invites others to join
Initiates conversation
Accepts peer ideas
Cooperates with peers
Volunteers to help others
Joins ongoing activity
Seems happy to see guardian
Shows affection for familiar adults
Trusts familiar adults
Seeks help when hurt
Appears happy when playing with others
Shows preference for a familiar adult
Cooperates with others
Organizes play with other children
Legend of Studies:
Black: PLBS (items reverse-coded)
Red: ECLS-K
Blue: SSRS
Green: DECA
Purple: SRQ
Low
SOCIAL

Many studies used the ECLS-K for their measure of AtL but were not consistent in the operationalization of AtL (see Figure 3). Across eight separate studies, AtL was operationalized to include aspects across four distinct quadrants, although there was considerable range within these. Common in all studies was the inclusion of some aspects of attention. Five of the eight studies similarly included persistence. The ECLS-K includes an item on pays attention as well as persists. Although the ECLS-K also includes an item on "easily adapts to changes in routines," none of the operationalizations of AtL include this. The scale also does not mention interacting with peers, yet three studies include social skills—peer collaboration, participating in groups, and cooperating with others. Figure 3 demonstrates a lack of consistency in terms of these studies.

One final area of misalignment was particular to one study. Hooper et al. (2010) used the term Approaches to Learning but operationalized it as attention. They described the desire to measure attention in young children, yet they used the ELCS-K AtL scale. Although the use of the term (AtL) and measurement (ECLS-K scale) was consistent, the operationalization of AtL as attention is not in line with previous conceptualizations of AtL using the same scale. While the ELCS-K scale does include the item "pays attention well," it also contains five other items that do not relate to attention.

While not misaligned, Bustamente's inclusion of AtL in four separate studies is, at times, inconsistent across operationalization and measurement (Bustamante & Hindman, 2018, 2019; Bustamante et al., 2017; Bustamante, White, & Greenfield, 2018). In 2017 and 2018, he examined the link between AtL and preschool science. In 2017, Bustamante et al. described AtL as "motivation, persistence, initiative, and a positive disposition towards learning (p. 112). He measured AtL using the learning-to-learn scale. In 2018, he similarly described it as persistence,

motivation, and flexible thinking, but went on to operationalize it using the subdomains of the learning-to-learn scale. He measured it using the learning-to-learn scale as he did in the previous study. In a separate study in 2018 with Hindman, Bustamente referred to Head Start's definition of AtL as persistence, sustained focus, peer communication/collaboration, and openness to new and challenging experiences. In this study, Bustamante used a nationally representative dataset that employed the AtL scale used in the ELCS-K. In 2019, Bustamante and Hindman described AtL as "investigating a new idea, solving a problem that arises in a challenging activity, or working collaboratively with adults or peers to complete an assignment" (p. 3). Although they describe the discrete components of AtL as those subscales of the learning-to-learn scale, they measure AtL using the ECLS-K scale. Acknowledging the limitations of using nationally representative data with pre-existing measures selected, it seems misaligned to describe AtL as measured one way but operationalized another. Interestingly, in 2019, Bustamante and Hindman state, "simply put, approaches to learning skills can be thought of as applications of executive functioning and social-emotional skills to independent and collaborative learning situations across a wide range of domains" (p. 5). This description highlights the positioning of AtL as a manifestation of executive function and omits aspects of initiative, creativity, and problem-solving.

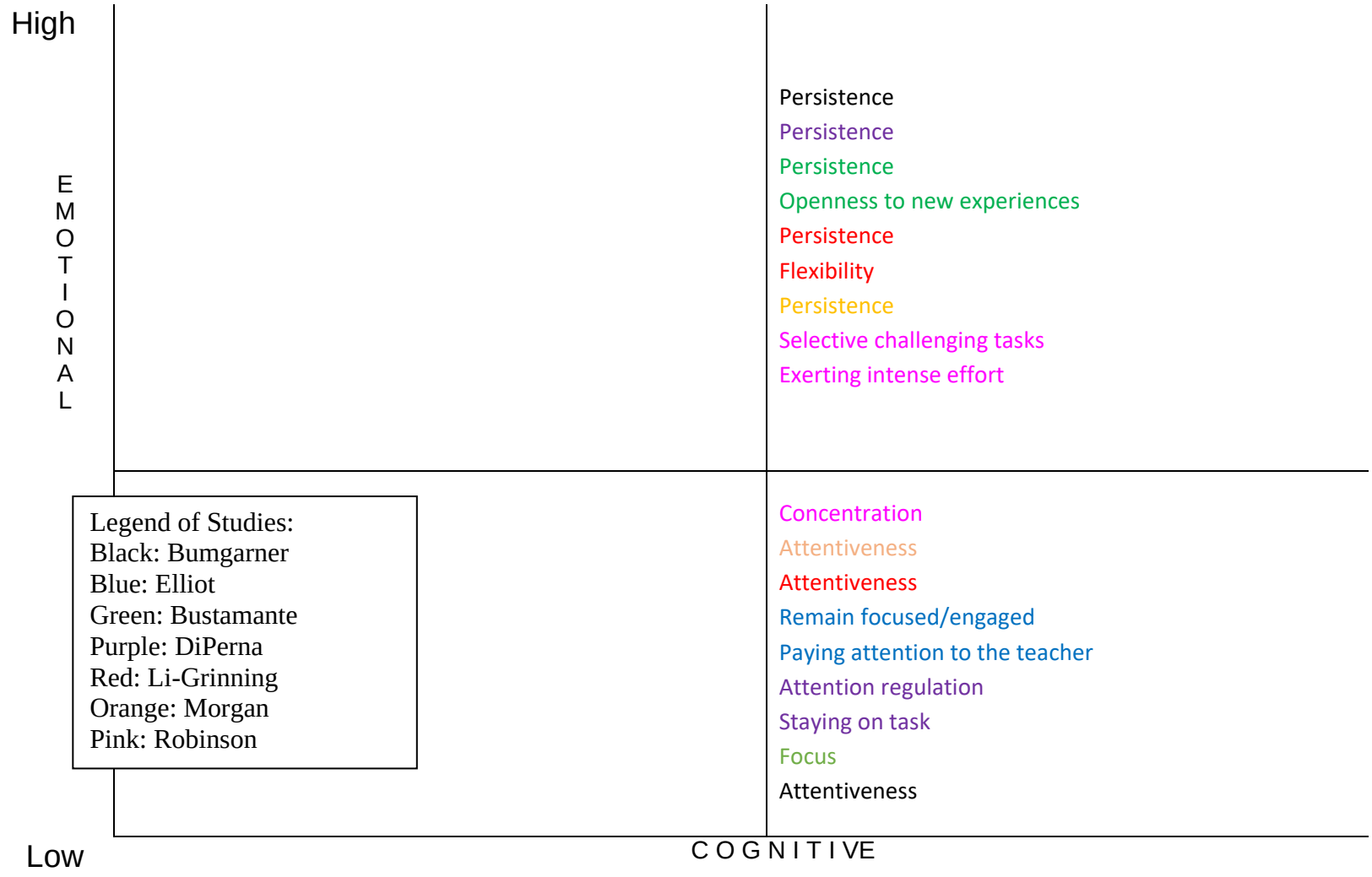


Figure 3

Operationalizations of AtL using ECLS-K AtL Scale

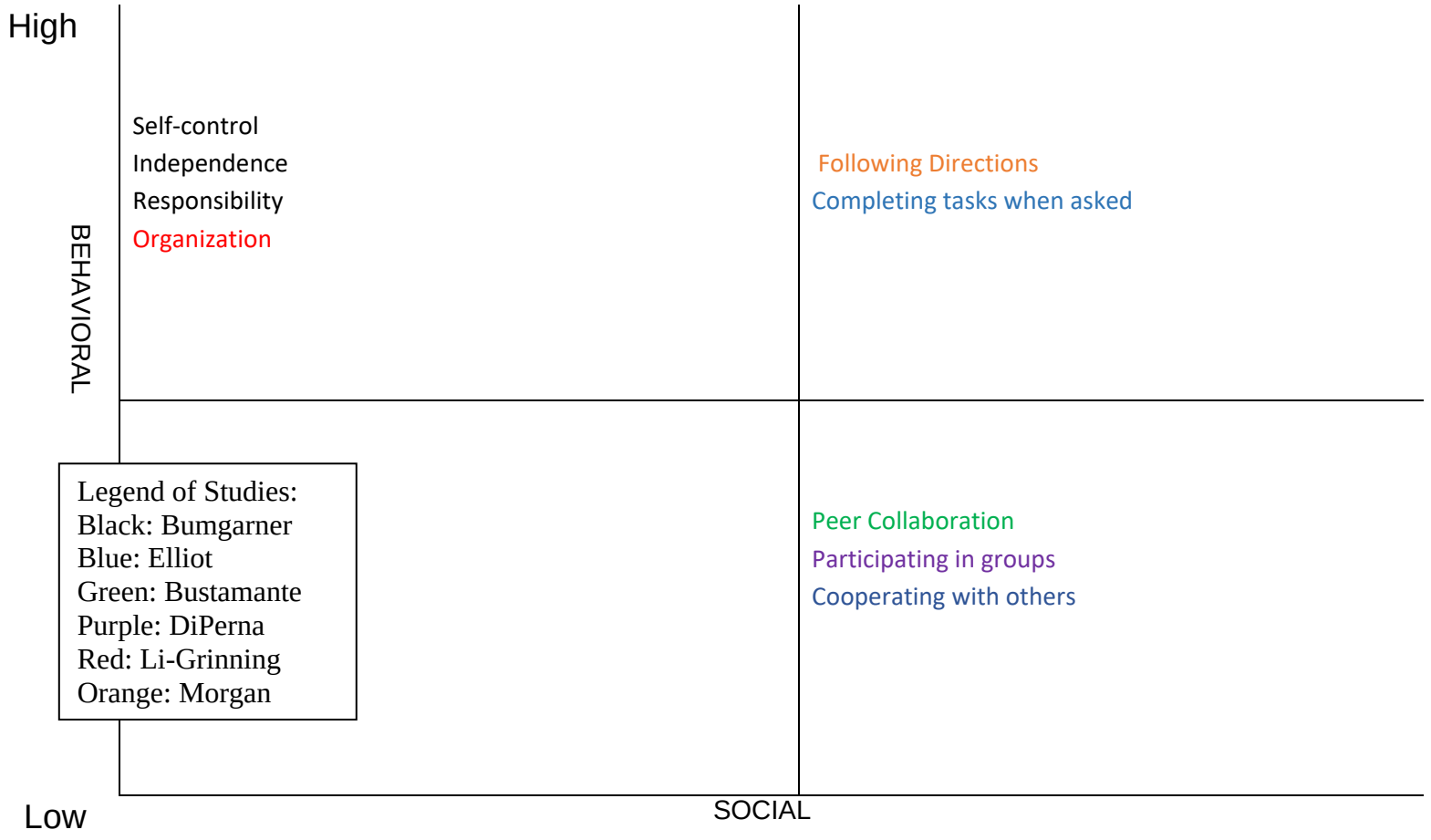


Figure 3. *(cont.)*

The above section highlighted issues related to the jingle fallacy. As an umbrella term, AtL has been described and measured in a wide variety of ways. In many cases, inconsistences across operationalization and measurement have resulted in conceptual and measurement clutter. Studies using the same measure of AtL have described it differently, while studies describing AtL, in the same way, have measured it differently. However, in examining the measurements of AtL, another issue was brought to the forefront—what happens when studies use the same assessment but measure different constructs?

The Jangle Issue: Inconsistencies Across Measurement

Teachers, cognitive psychologists, and developmental scientists are interested in how children learn, and each field may view the topic from a different lens. Without communicating about their research, a jangle fallacy may result, when researchers study very similar topics but refer to them by different names. Such is the case for AtL, where there are three potentially related or overlapping constructs, adjustment, behavioral engagement in learning, classroom participation, very similar to AtL. In many cases, the same measurement tool has been used to measure each one of these constructs.

Adjustment

Approaches to learning is similar to a construct called *adjustment*, a broad term that describes children's "school affect and attitude and their involvement of engagement with the school environment" (Birch & Ladd, 1997, p. 64). It is often used to explain how children adapt to novel learning situations, such as the period of transition into preschool or kindergarten (Sasser et al., 2015). While previous literature may have focused on more cognitive aspects of adjustment, like academic achievement, the term has evolved to encompass children's behavior and attitudes associated with learning (Herndon, Bailey, Shewark, Denham, & Bassett, 2013). It

includes behavioral styles that enable children to form relationships with classmates and peers (Ladd, Birch, & Buhs, 1999).

One measure of children's adjustment is the Teacher Rating Scale of School Adjustment (TRSSA), which assesses the extent to which children enjoy school, cooperate with others, accept teachers' authority, and follow classroom rules (Birch & Ladd, 1997). More specifically, one subscale of TRSSA is self-directed learning, which measures the degree to which children seek challenges, work independently, and are self-directed. It has been used in several studies as a measure of children's adjustment (Betts, Rotenberg, Trueman, & Stiller, 2012; Li & Lau, 2019; Murray, Murray, & Waas, 2008; Yoleri, 2015) as well as children's engagement (Cadima, Doumen, Verschueren, & Buyse, 2015; Hernández et al., 2018, 2016; Lietaert, Roorda, Laevers, Verschueren, & Fraine, 2015)

However, there are two issues related to the term adjustment. The first is the construct adjustment has been measured using AtL measurements. Two studies have measured adjustment using the PLBS: Herndon et al. (2013) measured the adjustment of Head Start children, and Bailey, Denham, Curby, and Bassett (2016) measured preschool children's school adjustment. Denham et al. (2012) measured adjustment using both the PLBS and the TRSSA. Finally, Harrison, McDleod, Berthelsen, and Walker (2009) measured children's school adjustment using the ECLS-K AtL scale.

In addition, the TRSSA, a measure of children's adjustment, has been used to measure the construct of AtL. Daniels (2014) measured children's AtL using three subscales of the TRSSA, on-task classroom involvement, maturity, and positive orientation. Her study focused on AtL as children's positive school-related attitudes that help them adapt to kindergarten. Stipek et al. (2010) measured children's learning-related behaviors using four items from the TRSSA—

works independently, seeks challenges, accepts responsibility, and is tuned in to what is going on. They describe learning-related behaviors as one component of self-regulation observable in the classroom.

These studies highlight the potential overlap between AtL and adjustment. In some studies, adjustment is evaluated through AtL measures, and in other studies, AtL is rated through adjustment measures. While adjustment highlights strategies children use as they adapt to novel learning environments, adjustment may be a form of AtL along a developmental sequence. As Stipek et al. (2010) point out, learning-related behaviors (like AtL or adjustment) have been shown to predict academic achievement; however, it is possible that academic achievement helps support adjustment or that the relationship is bidirectional. More clarity is needed when these constructs are used to study children's academic performance to ensure that we adequately measure what we purport to measure and that it is conceptually distinct from other constructs.

Behavioral Engagement in Learning

Previous studies have identified engagement as a multidimensional construct, including cognitive, behavioral, and emotional elements (Fredricks, Blumenfeld, & Paris, 2004; Parker, Nelson, & Burns, 2010). Behavioral engagement (BE) in learning describes "observable behaviors that children show during classroom learning activities" (Robinson & Mueller, 2014, p. 326). BE includes a range of actions that "exemplify students' approaches to classroom learning" (Robinson, 2013, p. 23), including persistence, responding to teachers' directions, and active participation (Bodovski & Farkas, 2007). It has also been conceptualized as involvement, attention, and self-reliance (Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009; Rimm-Kaufman et al., 2002) or active participation and focused involvement (Halliday et al., 2018).

BE has been measured in various ways. Hughes and Kwok (2007) measured it using items from the Conscientious scale of the Big Five Inventory and the Social Competence Scale. Searle, Sawyer, Miller-Lewis, and Baghurst (2014) measured engagement using the Rochester Assessment Package for Schools engagement, which included items measuring behavior engagement, operationalized as effort, attention, persistence. Yang and Lamb (2014) examined behavioral engagement using a teacher-reported measure, the Child Behavior Rating Scale, which taps children's behavior when completing tasks and engagement in social situations. Finally, in one study, engagement was measured via the TRSSA, specifically items rating children's cooperative participation and self-directness (Bryce et al., 2018).

Engagement has also been measured via observation. Halliday et al. (2018) sought to create a laboratory-based measurement of global engagement, which included attention to instructions, on-task behavior, persistence, positive/negative affect, and strategy use. It has been studied through observational measures (Guo, Sun, Breit-Smith, Morrison, & Connor, 2015; Parker et al., 2010; Rimm-Kaufman et al., 2009). Both Rimm-Kaufman et al. (2009) and Guo et al. (2015) measured behavioral engagement using the classroom observation system. Rimm-Kauffman et al. (2009) used the observed child engagement scale, while Guo looked at active and passive engagement and global ratings of attention and self-reliance.

Although there is a conceptual overlap between behavioral engagement and AtL (i.e., persistence, attention, and involvement), there is also some measurement overlap between the two constructs. Using the ECLS-K dataset, in both Bodovski and Farkas (2007) and Robinson and Mueller (2014), behavioral engagement was measured using the AtL scale. Halliday et al. (2018) note that BE has also been measured using the PLBS (an AtL scale), the learning-to-learn scales, and the Cooper-Farran Behavioral rating scales, which are not measures of AtL but which

have been used in studies of AtL. Similar to adjustment, there is no clear consensus in the field about how these terms, behavioral engagement, and AtL, are distinct and what specific measurement techniques could distinguish between these constructs.

Classroom Behavior/Participation

Finally, one last construct, classroom participation, shares overlap with AtL. Classroom participation includes students' "self-directed behavior, willingness to adhere to the social expectations of the classroom, and independent work" (Valiente, Lemery-Chalfant, & Swanson, 2010, p. 436). Given that AtL has been defined as children's classroom-based behaviors that support learning, active participation in the classroom, it seems a likely component of AtL.

Classroom participation has been measured primarily through teacher reports. Sasser et al. (2015) measured classroom participation from items drawn from a researcher-created school readiness inventory that included items such as following rules, enthusiasm about learning, and being careful with his or her work. Rimm-Kaufman et al. (2009) measured participation through a researcher-designed self-control scale and the mock report card, which includes following classroom procedures and works well independently. Tindal, Irvin, Nese, and Slater (2015) measured participation using the Child Behavior Rating Scale, which includes items such as observes rules, willingness to share toys, and complies with adult directives.

Some studies have relied on similar measures. For example, Royer, Provost, Tarabulsky, and Coutu (2008) measured classroom participation using the TRSSA; the cooperative and autonomous participation subscales were used. In their study, participation mediated the relationship between AtL (measured through the PLBS) and children's relationships with their teachers. Similarly, Valiente et al. (2010) measured children's self-directed participation and cooperative participation from the TRSSA scale. Bierman et al. (2009) measured children's

classroom participation using the school readiness inventory. As can be seen, both the TRSSA and the school readiness inventory have been used in other studies as measures of AtL.

Taken together, there are noted areas of misalignment between measurement, construct, and operationalization. Measures of AtL, like the PLBS and the ELCS-K, have also been used to measure adjustment, classroom participation, and behavioral engagement in learning. Measures, like the TRSSA, have been used to measure AtL, behavioral engagement in learning, and adjustment. Across some studies, the terms are used interchangeably. While these constructs may share conceptual overlap in subdimensions, like attention or involvement in learning, it remains difficult to fully disentangle what is unique about each construct, and without an idea about the content of the construct, it remains challenging to measure it accurately.

Can Approach to Learning be Defined?

This review has documented areas of misalignment across definition, operationalization, and measurement for AtL. Jones et al. (2016) describe this as the jingle and jangle fallacies. Jingle refers to the ways in which constructs are the same because they use the same name or are measured the same way. AtL includes a vast range of skills and dispositions across social, emotional, cognitive, and behavioral domains. Researchers may find associations between their particular set of skills labeled AtL and academic outcomes, but because these researchers are using different dimensions, there is no consistency across findings. The jangle fallacy occurs when researchers use different terms to describe similar constructs (Reeves et al., 2014). Approaches to learning and classroom participation may be terms used in educational literature, while adjustment or behavioral engagement are used more in the psychological literature. Using these different terms but describing similar constructs (and measuring them with the same measurements) can make it challenging to reach conceptual clarity.

What can move the field forward in the study of AtL? First, it may be necessary to ground this construct with theory, which may help illuminate critical dimensions and subdomains. For example, Chen and McNamee (2011) emphasize Vygotsky's theory in their description of AtL. Using this theory would then encourage researchers to focus measurement on the context in which learning occurs and accentuate the importance of the social environment in the development of children's AtL. Other theories may underscore children's affective engagement or underlying psychological competencies like motivation (Halliday et al., 2018).

Second, it will be essential to develop an agreed-upon list of what constitutes AtL. Across studies, many relied on depictions of AtL that included original aspects of the NEGP's definition: persistence, opening, flexibility, eagerness to learn, problem-solving, and risk-taking. More work is needed to build a conceptual framework around these terms highlighting how this set of skills supports, as Kagan et al. (1995) contend, the development of children's dispositions as learners. A precise definition and conceptualization of AtL will clear the way to develop or refine valid measures of AtL.

Third, it is crucial to consider the NEGP's original description of AtL and whether the construct requires any updates. The NEGP published their work in 1995, and much research has occurred in the intervening 25 years. Since that time, we have gained a much better understanding of the role of executive function in directing attention and focus. While attention had initially been included in the description of AtL, it may be conceptually clearer to leave aspects of attention or focus out of AtL. In this way, we could focus on those aspects of AtL, like persistence, imagination, and problem-solving, that integrate cognitive and emotional functioning.

Finally, more work should be done on the measurement of AtL. A more fine-grained analysis is needed that captures which learning strategies were successful in which areas of the classroom. Examination of AtL should also account for contextual variables such as the kind of curriculum and child guidance used in the classroom. More inquiry and play-based curricula require children to interact with each other, collaborate to learn, and converse with the teacher. AtL will necessarily look different in these classrooms than those who support more individualized learning (i.e., Montessori or Direct Instruction). Examining the contextual factors will also help distinguish learning strategies from classroom participation, rule adherence, or following directions.

AtL is a vital construct for children's development and a critical dimension of children's school readiness. As our understanding of children's development becomes more nuanced, our abilities to conceptualize and measure development need to keep pace. Doing this does not include taking a term or idea and stretching it to include any number of skills or dimensions believed to be necessary for children's learning. Rather, it includes more precise conceptualization and better measurement to capture the multi-dimensional nature of this construct more accurately. Approaches to learning should not be a construct with many names; it should be a construct with one.

References

Abenavoli, R. M., Greenberg, M. T., & Bierman, K. L. (2017). Identification and validation of school readiness profiles among high-risk kindergartners. *Early Childhood Research Quarterly*, *38*, 33–43. doi: 10.1016/j.ecresq.2016.09.001

Ansari, A., & Gershoff, E. (2015). Learning-related social skills as a mediator between teacher instruction and child achievement in Head Start: Learning-related social skills and teacher instruction. *Social Development*, *24*(4), 699–715. doi: 10.1111/sode.12124

Bailey, C. S., Denham, S., Curby, T. W., & Bassett, H. H. (2016). Emotional and organizational supports for preschoolers' emotion regulation: Relations with school adjustment. *Emotion*, *16*(2), 263–279. doi: 10.1037/a0039772

Barbu, O. C., Yaden, D. B., Levine-Donnerstein, D., & Marx, R. W. (2015). Assessing approaches to learning in school readiness: Comparing the Devereux Early Childhood Assessment to an early learning standards-based measure. *AERA Open*, *1*(3), 1–15. doi: 10.1177/2332858415593923

Berthelsen, D., Hayes, N., White, S. L. J., & Williams, K. E. (2017). Executive function in adolescence: Associations with child and family risk factors and self-regulation in early childhood. *Frontiers in Psychology*, *8*, 903. doi: 10.3389/fpsyg.2017.00903

Betts, L. R., Rotenberg, K. J., Trueman, M., & Stiller, J. (2012). Examining the components of children's peer liking as antecedents of school adjustment. *British Journal of Developmental Psychology*, *30*(2), 303–325. doi: 10.1111/j.2044-835X.2011.02041.x

Bierman, K. L., Torres, M. M., Domitrovich, C. E., Welsh, J. A., & Gest, S. D. (2009). Behavioral and cognitive readiness for school: Cross-domain associations for children attending Head Start. *Social Development*, *18*(2), 305–323. doi: 10.1111/j.1467-9507.2008.00490.x

Birch, S. H., & Ladd, G. W. (1997). The teacher-child relationship and children's early school adjustment. *Journal of School Psychology*, *35*(1), 61–79. doi: 10.1016/S0022-4405(96)00029-5

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. doi: 10.1037//0003-066X.57.2.111

Blair, C., & Raver, C. C. (2015). School readiness and self-regulation: A developmental psychobiological approach. *Annual Review of Psychology, 66*, 711–731. doi: 10.1146/annurev-psych-010814-015221

Bodovski, K., & Farkas, G. (2007). Mathematics growth in early elementary school: The roles of beginning knowledge, student engagement, and instruction. *The Elementary School Journal*, *108*(2), 115–130. doi: 10.1086/525550

Borghans, L., Duckworth, A. L., Heckman, J. J., & Ter Weel, B. (2008). The economics and psychology of personality traits. *Journal of Human Resources*, *43*(4), 972–1059. doi: 10.1353/jhr.2008.0017

Bornstein, M. H., Hahn, C.-S., & Haynes, O. M. (2010). Social competence, externalizing, and internalizing behavioral adjustment from early childhood through early adolescence: Developmental cascades. *Development and Psychopathology*, *22*(4), 717–735. doi: 10.1017/S0954579410000416

Brock, L. L., Rimm-Kaufman, S. E., Nathanson, L., & Grimm, K. J. (2009). The contributions of 'hot' and 'cool' executive function to children's academic achievement, learning-related behaviors, and engagement in kindergarten. *Early Childhood Research Quarterly*, *24*(3), 337–349. doi: 10.1016/j.ecresq.2009.06.001

Bryce, C. I., Goble, P., Swanson, J., Fabes, R. A., Hanish, L. D., & Martin, C. L. (2018). Kindergarten school engagement: Linking early temperament and academic achievement at the transition to school. *Early Education and Development*, *29*(5), 780–796. doi: 10.1080/10409289.2017.1404275

Bulotsky-Shearer, R., Fernandez, V., Dominguez, X., & Rouse, H. L. (2011). Behavioral problems in learning activities and social interaction in Head Start classrooms and early reading math and approaches to learning. *School Psychology Review*, *40*(1), 39–56. doi: 10.1080/02796015.2011.12087727

Bumgarner, E., Martin, A., & Brooks-Gunn, J. (2013). Approaches to learning and Hispanic children's math scores: The moderating role of English proficiency. *Hispanic Journal of Behavioral Sciences*, *35*(2), 241–259. doi: 10.1177/0739986312473580

Bustamante, A. S., & Hindman, A. H. (2018). Construyendo en la Fuerza: Approaches to learning and school readiness gains in Latino children served by Head Start. *Early Childhood Research Quarterly*. doi: 10.1016/j.ecresq.2018.06.003

Bustamante, A. S., & Hindman, A. H. (2019). Classroom quality and academic school readiness outcomes in Head Start: The indirect effect of approaches to learning. *Early Education and Development*, *30*(1), 19–35. doi: 10.1080/10409289.2018.1540249

Bustamante, A. S., White, L. J., & Greenfield, D. B. (2017). Approaches to learning and school readiness in Head Start: Applications to preschool science. *Learning and Individual Differences*, *56*, 112–118. doi: 10.1016/j.lindif.2016.10.012

Bustamante, A. S., White, L. J., & Greenfield, D. B. (2018). Approaches to learning and science education in Head Start: Examining bidirectionality. *Early Childhood Research Quarterly*, *44*, 34–42. doi: 10.1016/j.ecresq.2018.02.013

Cadima, J., Doumen, S., Verschueren, K., & Buyse, E. (2015). Child engagement in the transition to school: Contributions of self-regulation, teacher–child relationships and classroom climate. *Early Childhood Research Quarterly*, *32*, 1–12. doi: 10.1016/j.ecresq.2015.01.008

Carter, A. S., Briggs-Gowan, M. J., & Davis, N. O. (2004). Assessment of young children's social-emotional development and psychopathology: Recent advances and recommendations for practice. *Journal of Child Psychology and Psychiatry*, *45*(1), 109–134. doi: 10.1046/j.0021-9630.2003.00316.x

Cerda, C. A., Im, M. H., & Hughes, J. N. (2014). Learning-related skills and academic achievement in academically at-risk first graders. *Journal of Applied Developmental Psychology*, *35*(5), 433–443. doi: 10.1016/j.appdev.2014.08.001

Chen, J.-Q., & McNamee, G. D. (2011). Positive approaches to learning in the context of preschool classroom activities. *Early Childhood Education Journal*, *39*(1), 71–78. doi: 10.1007/s10643-010-0441-x

Coolahan, K., Fantuzzo, J., Mendez, J., & McDermott, P. (2000). Preschool peer interactions and readiness to learn: Relationships between classroom peer play and learning behaviors and conduct. *Journal of Educational Psychology*, *92*(3), 458–465. doi: 10.1037/0022-0663.92.3.458

Daniels, D. H. (2014). Children's affective orientations in preschool and their initial adjustment to kindergarten: Children's affective orientations in preschool. *Psychology in the Schools*, *51*(3), 256–272. doi: 10.1002/pits.21748

De Feyter, J. J., & Winsler, A. (2009). The early developmental competencies and school readiness of low-income, immigrant children: Influences of generation, race/ethnicity, and national origins. *Early Childhood Research Quarterly*, *24*(4), 411–431. doi: 10.1016/j.ecresq.2009.07.004

Denham, S., Bassett, H. H., Way, E., Mincic, M., Zinsser, K., & Graling, K. (2012). Preschoolers' emotion knowledge: Self-regulatory foundations, and predictions of early school success. *Cognition & Emotion*, *26*(4), 667–679. doi: 10.1080/02699931.2011.602049

DiPerna, J. C., Lei, P.-W., & Reid, E. E. (2007). Kindergarten predictors of mathematical growth in the primary grades: An investigation using the Early Childhood Longitudinal Study--Kindergarten cohort. *Journal of Educational Psychology*, *99*(2), 369–379. doi: 10.1037/0022-0663.99.2.369

Doctoroff, G. L., Fisher, P. H., Burrows, B. M., & Edman, M. T. (2016). Preschool children's interest, social-emotional skills, and emergent mathematics skills: Preschool children's interest. *Psychology in the Schools*, *53*(4), 390–403. doi: 10.1002/pits.21912

Elliott, L. (2019). Profiles of academic, cognitive, and behavioral development from kindergarten to third grade. *Learning and Individual Differences*, *70*, 109–120. doi: 10.1016/j.lindif.2019.01.010

Farran, D. (2011). Rethinking School Readiness. *Exceptionality Education International*, *21*(2), 5–15. Retrieved from https://ir.lib.uwo.ca/eei/vol21/iss2/3

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. doi: 10.3102/00346543074001059

George, J., & Greenfield, D. B. (2005). Examination of a structured problem-solving flexibility task for assessing approaches to learning in young children: Relation to teacher ratings and children's achievement. *Journal of Applied Developmental Psychology*, *26*(1), 69–84. doi: 10.1016/j.appdev.2004.10.006

Guo, Y., Sun, S., Breit-Smith, A., Morrison, F. J., & Connor, C. M. (2015). Behavioral engagement and reading achievement in elementary-school-age children: A longitudinal cross-lagged analysis. *Journal of Educational Psychology*, *107*(2), 332. doi: 10.1037/a0037638

Hair, E., Halle, T., Terry-Humen, E., Lavelle, B., & Calkins, J. (2006). Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade. *Early Childhood Research Quarterly*, *21*(4), 431–454. doi: 10.1016/j.ecresq.2006.09.005

Halle, T. G., & Darling-Churchill, K. E. (2016). Review of measures of social and emotional development. *Journal of Applied Developmental Psychology*, *45*, 8–18. doi: 10.1016/j.appdev.2016.02.003

Halliday, S. E., Calkins, S. D., & Leerkes, E. M. (2018). Measuring preschool learning engagement in the laboratory. *Journal of Experimental Child Psychology*, *167*, 93–116. doi: 10.1016/j.jecp.2017.10.006

Harrison, L. J., McLeod, S., Berthelsen, D., & Walker, S. (2009). Literacy, numeracy, and learning in school-aged children identified as having speech and language impairment in early childhood. *International Journal of Speech-Language Pathology*, *11*(5), 392–403. doi: 10.1080/17549500903093749

Hernández, M. M., Eisenberg, N., Valiente, C., Spinrad, T. L., Berger, R. H., VanSchyndel, S. K., … others. (2018). Bidirectional associations between emotions and school adjustment. *Journal of Personality*, *86*(5), 853–867. doi: 10.1111/jopy.12361

Hernández, M. M., Eisenberg, N., Valiente, C., VanSchyndel, S. K., Spinrad, T. L., Silva, K. M., … others. (2016). Emotional expression in school context, social relationships, and academic adjustment in kindergarten. *Emotion*, *16*(4), 553. doi: 10.1037/emo0000147

Herndon, K. J., Bailey, C. S., Shewark, E. A., Denham, S., & Bassett, H. H. (2013). Preschoolers' emotion expression and regulation: Relations with school adjustment. *The Journal of Genetic Psychology*, *174*(6), 642–663. doi: 10.1080/00221325.2012.759525

Hooper, S. R., Roberts, J., Sideris, J., Burchinal, M., & Zeisel, S. (2010). Longitudinal predictors of reading and math trajectories through middle school for African American versus Caucasian students across two samples. *Developmental Psychology*, *46*(5), 1018–1029. doi: 10.1037/a0018877

Hughes, J., & Kwok, O. (2007). Influence of student–teacher and parent–teacher relationships on lower achieving readers' engagement and achievement in the primary grades. *Journal of Educational Psychology*, *99*(1), 39–51. doi: 10.1037/0022-0663.99.1.39

Hunter, L. J., Bierman, K. L., & Hall, C. M. (2018). Assessing noncognitive aspects of school readiness: The predictive validity of Brief Teacher Rating Scales of Social–Emotional Competence and approaches to learning. *Early Education and Development*, *29*(8), 1081–1094. doi: 10.1080/10409289.2018.1495472

Hyson, M. (2008). *Enthusiastic and engaged learners*. New York, NY: Teachers College Press.

Jones, S.M., Bailey, R., Brush, K., Nelson, B., & Barnes, S. *What is the same and what is different?* Retrieved from https://easel.gse.harvard.edu/files/gse-easel-lab/files/words_matter_paper.pdf

Jones, S. M., Zaslow, M., Darling-Churchill, K. E., & Halle, T. G. (2016). Assessing early childhood social and emotional development: Key conceptual and measurement issues. *Journal of Applied Developmental Psychology*, *45*, 42–48. doi: 10.1016/j.appdev.2016.02.008

Kagan, S., Moore, E., & Bredekamp, S. (1995). *Reconsidering children's early learning and development: Toward common views and vocabulary*. Washington, DC: National Education Goals Panel.

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*(6), 1373–1400. doi: 10.1111/1467-8624.00101

LeBuffe, P., & Shapiro, V. (2004). Lending "strength" to the assessment of preschool social-emotional health. *The California School Psychologist*, *9*, 51–61. doi: 10.1007/BF03340907

Li, J.-B., & Lau, E. Y. H. (2019). Teacher–student conflict and preschoolers' adjustment in the transition to primary school: The role of child self-regulation and parents' positive

relations with others. *Early Education and Development*, *30*(3), 423–437. doi: 10.1080/10409289.2018.1535227

Lietaert, S., Roorda, D., Laevers, F., Verschueren, K., & Fraine, B. D. (2015). The gender gap in student engagement: The role of teachers' autonomy support, structure, and involvement. *British Journal of Educational Psychology*, *85*(4), 498–518. doi: 10.1111/bjep.12095

Li-Grining, C. P., Votruba-Drzal, E., Maldonado-Carreno, C., & Haas, K. (2010). Children's early approaches to learning and academic trajectories through fifth grade. *Developmental Psychology*, *46*(5), 1062–1077. doi: 10.1037/a0020066

Maier, M. F., Vitiello, V. E., & Greenfield, D. B. (2012). A multilevel model of child- and classroom-level psychosocial factors that support language and literacy resilience of children in Head Start. *Early Childhood Research Quarterly*, *27*(1), 104–114. doi: 10.1016/j.ecresq.2011.06.002

McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly*, *21*(4), 471–490. doi: 10.1016/j.ecresq.2006.09.003

McClelland, M. M., & Morrison, F. J. (2003). The emergence of learning-related social skills in preschool children. *Early Childhood Research Quarterly*, *18*(2), 206–224. doi: 10.1016/S0885-2006(03)00026-7

McCoy, D. C., Connors, M. C., Morris, P. A., Yoshikawa, H., & Friedman-Krauss, A. H. (2015). Neighborhood economic disadvantage and children's cognitive and social-emotional development: Exploring Head Start classroom quality as a mediating mechanism. *Early Childhood Research Quarterly*, *32*, 150–159. doi: 10.1016/j.ecresq.2015.04.003

McDermott, P. A., Rikoon, S. H., & Fantuzzo, J. W. (2014). Tracing children's approaches to learning through Head Start, kindergarten, and first grade: Different pathways to different outcomes. *Journal of Educational Psychology*, *106*(1), 200–213. doi: http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0033547

McDermott, P. A., Rovine, M. J., Reyes, R. S., Chao, J. L., Scruggs, R., Buek, K., & Fantuzzo, J. W. (2018). Trajectories of early education learning behaviors among children at risk: A growth mixture modeling approach. *Psychology in the Schools*, *55*(10), 1205–1223. doi: 10.1002/pits.22145

Meng, C. (2015). Classroom quality and academic skills: Approaches to learning as a moderator. *School Psychology Quarterly*, *30*(4), 553–563. doi: 10.1037/spq0000108

Murray, C., Murray, K. M., & Waas, G. A. (2008). Child and teacher reports of teacher–student relationships: Concordance of perspectives and associations with school adjustment in urban kindergarten classrooms. *Journal of Applied Developmental Psychology*, *29*(1), 49–61. doi: 10.1016/j.appdev.2007.10.006

Nesbitt, K. T., Farran, D. C., & Fuhs, M. W. (2015). Executive function skills and academic achievement gains in prekindergarten: Contributions of learning-related behaviors. *Developmental Psychology*, *51*(7), 865–878. doi: 10.1037/dev0000021

Neuenschwander, R., Röthlisberger, M., Cimeli, P., & Roebers, C. M. (2012). How do different aspects of self-regulation predict successful adaptation to school? *Journal of Experimental Child Psychology*, *113*(3), 353–371. doi: 10.1016/j.jecp.2012.07.004

Parker, D. C., Nelson, J. S., & Burns, M. K. (2010). Comparison of correlates of classroom behavior problems in schools with and without a school-wide character education program. *Psychology in the Schools*, *47*(8), 817–827. doi: 10.1002/pits.20506

Ponitz, C. C., Rimm-Kaufman, S. E., Grimm, K. J., & Curby, T. W. (2009). Kindergarten classroom quality, behavioral engagement, and reading achievement. *School Psychology Review*, *38*(1), 102–120. doi: 10.1080/02796015.2009.12087852

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2015). Are approaches to learning in kindergarten associated with academic and social competence similarly? *Child & Youth Care Forum*, *44*(6), 757–776. doi: 10.1007/s10566-015-9307-0

Reeves, R. V., Venator, J., & Howard, K. (2014). *The character factor: Measures and impact of drive and prudence*. Retrieved from The Center on Children and Families website: https://www.brookings.edu/wp-content/uploads/2016/07/22_character_factor_opportunity_reeves.pdf

Reid, E. E., Diperna, J. C., Missall, K., & Volpe, R. J. (2014). Reliability and structural validity of the teacher rating scales of early academic competence. *Psychology in the Schools*, *51*(6), 535–553. doi: 10.1002/pits.21769

Rimm-Kaufman, S. E., Curby, T. W., Grimm, K. J., Nathanson, L., & Brock, L. L. (2009). The contribution of children's self-regulation and classroom quality to children's adaptive behaviors in the kindergarten classroom. *Developmental Psychology*, *45*(4), 958–972. doi: 10.1037/a0015861

Rimm-Kaufman, S. E., Early, D. M., Cox, M. J., Saluja, G., Pianta, R. C., Bradley, R. H., & Payne, C. (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. doi: 10.1016/S0193-3973(02)00128-4

Robinson, K. (2013). Early disparities in mathematics gains among poor and non-poor children: Examining the role of behavioral engagement in learning. *The Elementary School Journal*, *114*(1), 22–47. doi: 10.1086/670737

Robinson, K., & Mueller, A. S. (2014). Behavioral engagement in learning and math achievement over kindergarten: A contextual analysis. *American Journal of Education*, *120*(3), 325–349. doi: 10.1086/675530

Royer, N., Provost, M., Tarabulsy, G., & Coutu, S. (2008). Kindergarten children's relatedness to teachers and peers as a factor. *Journal of Applied Research on Learning*, *2*(1), 20. Retrieved from http://en.copian.ca/library/research/jarl/kindergarten_children/kindergarten_children.pdf

Sandilos, L. E., Whittaker, J. V., Vitiello, V. E., & Kinzie, M. B. (2019). Preschoolers' school readiness profiles and the teacher-child relationship: A latent transition approach. *Journal of Applied Developmental Psychology*, *62*, 185–198. doi: 10.1016/j.appdev.2019.02.010

Sasser, T. R., Bierman, K. L., & Heinrichs, B. (2015). Executive functioning and school adjustment: The mediational role of pre-kindergarten learning-related behaviors. *Early Childhood Research Quarterly*, *30*, 70–79. doi: 10.1016/j.ecresq.2014.09.001

Searle, A. K., Sawyer, M. G., Miller-Lewis, L. R., & Baghurst, P. A. (2014). Prospective associations between children's preschool emotional and behavioral problems and kindergarten classroom engagement, and the role of gender. *The Elementary School Journal*, *114*(3), 380–405. doi: 10.1086/674421

Stipek, D., Newton, S., & Chudgar, A. (2010). Learning-related behaviors and literacy achievement in elementary school-aged children. *Early Childhood Research Quarterly*, *25*(3), 385–395. doi: 10.1016/j.ecresq.2009.12.001

Sung, J., & Wickrama, K. A. S. (2018). Longitudinal relationship between early academic achievement and executive function: Mediating role of approaches to learning. *Contemporary Educational Psychology*, *54*, 171–183. doi: 10.1016/j.cedpsych.2018.06.010

Tan, M., & Dobbs-Oates, J. (2013). Relationship between emergent literacy and early social–emotional development in preschool children from low-income backgrounds. *Early Child Development and Care*, *183*(11), 1509–1530. doi: 10.1080/03004430.2012.729051

Tindal, G., Irvin, P. S., Nese, J. F. T., & Slater, S. (2015). Skills for children entering kindergarten. *Educational Assessment*, *20*(4), 297–319. doi: 10.1080/10627197.2015.1093929

Ursache, A., Blair, C., & Raver, C. C. (2012). The promotion of self-regulation as a means of enhancing school readiness and early achievement in children at risk for school failure. *Child Development Perspectives*, *6*(2), 122–128. doi: 10.1111/j.1750-8606.2011.00209.x

Valiente, C., Lemery-Chalfant, K., & Swanson, J. (2010). Prediction of kindergartners' academic achievement from their effortful control and emotionality: Evidence for direct and moderated relations. *Journal of Educational Psychology*, *102*(3), 550–560. doi: http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0018992

Vitiello, V. E., & Greenfield, D. B. (2017). Executive functions and approaches to learning in predicting school readiness. *Journal of Applied Developmental Psychology, 53*, 1–9. doi: 10.1016/j.appdev.2017.08.004

Vitiello, V. E., Greenfield, D. B., Munis, P., & George, J. (2011). Cognitive flexibility, approaches to learning, and academic school readiness in Head Start preschool children. *Early Education and Development, 22*(3), 388–410. doi: 10.1080/10409289.2011.538366

Yang, P.-J., & Lamb, M. (2014). Factors influencing classroom behavioral engagement during the first year at school. *Applied Developmental Science*, *18*(4), 189–200. doi: 10.1080/10888691.2014.924710

Yoleri, S. (2015). Preschool children's school adjustment: Indicators of behaviour problems, gender, and peer victimisation. *Education 3-13, 43*(6), 630–640. doi: 10.1080/03004279.2013.848915

Appendix A

List of Studies Used in Analysis

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
Abenavoli, Greenberg, & Bierman (2017)	Learning Engagement	Attention, persistence, on-task behavior, learning behavior	School engagement: School Readiness Questionnaire	Enthusiastic about learning new things, able to follow teachers' directions
	Learning Behaviors		Learning Behaviors Scale	Attitudes and behaviors toward schoolwork: sticks to task, adopts a "don't care" attitude toward success
Ansari & Gershoff (2015)	Learning Related Social Skills	the ability to self-regulate and to get along with others	Behavioral Problems Index	Behavioral and attentional control
			PLBS	Competence motivation, attention persistence, and attitudes towards learning
			Personal Maturity Scale	Engagement in learning: interest and participation in activities, compliance with teachers' directions

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
Barbu et al. (2015)[1]	Approaches to Learning	initiative, curiosity, engagement, persistence, reasoning, and problem-solving skills	Devereaux Early Childhood Assessment	Self-control, Attachment, and Initiative
			Researcher Created Measure	13 items including has friends, follows rules, attends to tasks, seeks help, shows respect for toys
Bierman, Torres, & Domitrovitch (2008)	Behavioral Readiness	the capacity to approach learning tasks effectively with focused interest and sustained engagement,	School Readiness Inventory	Classroom participation, learning motivation, compliance, and conscientiousness
Berthelsen, Hayes, White, & Williams (2017)[2]	Approaches to Learning	Learning-related, regulatory behaviors that children exhibit when taking part in classroom activities	Social Skills Rating Scale	Attention, task persistence, eagerness to learn, learning independence, flexibility, and organization
Brock, Rimm-Kauffamn, Nathanson, & Grimm (2009)	Learning-Related Behaviors	Behavior which enables children to focus on a task or teacher-endorsed activity without interruption	Social competence and Adjustment Scale and	Self-Directed learning style Hyperactivity-Distractibility
			Mock Report Card	Work Habits: works well independently

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
			Teachers' Self-Control Rating Scale	Self-Control: makes careless errors, has to have things right away
Bulotsky-Shearer, Fernandez, Dominguez, & Rouse (2011)[3]	Approaches to Learning	Initiative and curiosity, engagement and persistence, and reasoning and problem-solving skills	PLBS	
Bumgarner, Martin, & Brooks-Gunn (2013)	Approaches to Learning	self-control, persistence, attentiveness, independence, and responsibility	ECLS-K Approaches to Learning Scale	
Bustamente, White, & Greenfield (2017)	Approaches to Learning	Curiosity, persistence, planning, motivation, and engagement in group learning	Learning-to-Learn Scale	Strategic planning, effectiveness motivation, interpersonal responsiveness in learning, vocal engagement in learning, sustained focus in learning, acceptance of novelty and risk, and group learning

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
Bustamente & Hindman (2018)	Approaches to Learning	a set of domain-general skills that help children navigate learning situations such as investigating a new idea, solving a problem that arises in a challenging activity, or working collaboratively with adults or peers to complete an assignment	ECLS-K Approaches to Learning Scale	
Bustamente & Hindman (2019)[4]	Approaches to Learning	Skills such as persistence, sustained focus, peer communication/collaboration, and openness to new and challenging experiences	ECLS-K Approaches to Learning Scale	This scale includes items that reflect attentiveness, task persistence, eagerness to learn, independence, flexibility, and organization.
Cerda, Im, & Hughes (2014)	Learning-Related Skills	behavioral self-regulation, prosocial skills, and the ability to maintain and focus attention	Effortful Control	Task Accuracy and Inhibitory Control via Direct Assessment task: Walk-a-Line, Star, Telephone Poles, and Circle

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
			Social Competence	Teacher Ratings of peer likability and prosocial behavior Peer-rated likability Peer nominations regarding prosocial behavior
			Behavioral Self-Regulation	Teacher rated classroom engagement Teacher-rated attention control and behavioral control
Daniels (2014)	Approaches to Learning	Affective orientations Engagement Task focus Persistence in the face of challenge Interpersonal responsiveness	Teacher Rating Scale of School Adjustment	On-Task Classroom Involvement Maturity Positive Engagement
DiPerna, Lei, & Reid (2007)	Approaches to Learning	persistence, attention regulation, following teacher directions, staying on task, participating in groups	ECLS-K Approaches to Learning Scale	
Doctoroff, Fisher, Burrows, & Edman (2016)	Global Interest	children's initiative, curiosity, and enthusiasm in	PLBS	Competence Motivation Attention/Persistence

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
		learning situations; orientation of attention to learning; independent pursuit of learning activities; and level of participation in, persistence with, and completion of learning activities		Attitude Toward Learning
Elliot (2019)	Approaches to Learning	remain focused and engaged and specific behaviors such as cooperating with other students, paying attention to the teacher, and completing tasks when asked	ECLS-K Approaches to Learning Scale	
George & Greenfield (2005)	Approaches to Learning	eagerness, curiosity, persistence, flexibility, inventiveness, engagement in a variety of new and familiar activities, preference for challenge, initiative, and self-direction	Social Skills Rating System	Ability to handle transitions, enthusiasm, and interest, persistence at challenging tasks, initiates conversations with peers, uses time appropriately, cooperates,

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
Hair, Halle, Terry-Humen, Lavelle, & Calkins (2006)	Approaches to Learning	openness and curiosity to tasks and challenges, task persistence, imagination, attentiveness, and cognitive learning style	ECLS-K Approaches to Learning Scale	Parent Report Teacher Report
Halliday, Calkins, & Leerkes (2018)	Learning Engagement	the behavioral, cognitive, and affective result of internal drives on-task behavior, attention during instructions, rule adherence, and the contribution of questions or observations at appropriate times.	PLBS	
Hooper, Roberts, Sideris, Burchinal, & Zeisel (2010)	Attention		ECLS-K Approaches to Learning Scale	
Hunter, Bierman, & Hall (2018)	Approaches to Learning	a set of skills that enable children to engage fully in learning, including self-regulation and executive functions	School Readiness Questionnaire	Being able to sit at a table and do work Being able to work independently Careful with work

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
				Willing to follow teacher instructions Enthusiastic about learning new things Can follow the rules/routines that are part of the school day
Li-Grinning, Votruba-Drzal, Maldonado-Carreno, & Haas (2010)	Approaches to Learning	the individual characteristics and observable behaviors that children show while taking part in learning activities. It includes persistence, emotion regulation, attentiveness, flexibility, and organization	ECLS-K Approaches to Learning Scale	Parent Report Teacher Report
			ECLS-K Self-Control Scale	The teacher version included four items on children's ability to control their temper, to accept peer ideas for group activities, to respect the property rights of others, and to respond appropriately to pressure from peers. The parent version included five items on children's ability to control their actions and feelings

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
McClelland, Acock, & Morrison (2006)	Learning-Related Skills	self-regulation and aspects of social competence (responsibility, independence, and cooperation)	Cooper-Farran Behavioral Rating Scale	Work-related skills: self-regulation, responsibility, independence, and cooperation
McCoy, Connors, Morris, Yoshikawa, & Friedman-Krauss (2015)	Positive Approaches to Learning	positive social interaction skills as well as their behavioral dispositions toward learning	Approaches to Learning Scale	7 items: making friends and accepting their ideas, enjoying learning and trying new things, showing imagination, comforting/helping others, and wanting to hear positive feedback
McDermott, Rikoon & Fantuzzo (2014)[5]	Approaches to Learning	the effortful and goal-directed mechanisms by which children go about classroom learning processes	LBS/PLBS	Competence Motivation Attention/Persistence Attitude Toward Learning
Meng (2015)	Approaches to Learning	initiative, engagement, persistence	PLBS	
Morgan, Farkas, & Wu (2009)	Learning-related behaviors	Remaining attentive and persistent at tasks	ECLS-K Approaches to Learning Scale	

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
Neuenschwander, Rothlisberger, Cimeli, & Roebers (2012)	Learning-Related behavior	listening to instructions, following directions, and accomplishment of tasks in a limited period of time	Researcher Created Measure	Persistence, self-reliance, efficiency of homework
Razza, Martin, & Brooks-Gunn (2015)	Approaches to Learning	attentiveness, persistence, flexibility, organization, and compliance	ECLS-K Approaches to Learning Scale	
Reid, Diperna, Missall, & Volpe (2014)	Approaches to Learning	openness and curiosity about new tasks, task persistence, and imagination	Teacher Rating Scales of Early Academic Competence	Academic Enablers Scale: taking care of things, organization, following directions, planning, maintaining attention, awareness of own behavior, interest in counting/reading/writing, persists when challenged, completing assigned tasks
Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock (2009)	Adaptive Behavior		Self-Control Scale	Cognitive and Behavioral Control: talks out of turn, persists, anticipates the consequences of

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
				actions, works towards goals
Robinson (2013)	Behavioral Engagement in Learning	selecting challenging tasks, exerting intense effort and concentration in the implementation of learning tasks in the classroom	Mock Report Card	Positive Work Habits: follows classroom procedures, works well independently, uses time wisely
Sandilos, Whittaker, Vitiello, & Kinzie (2019)	Approaches to Learning	adaptive behaviors that contribute to classroom learning;	Teacher-Child Rating Scale	Assertiveness, task orientation, social skills, frustration tolerance, conduct problems, internalizing problems, and learning problems
Sasser, Bierman, & Heinrichs (2015)	Learning-Related Behaviors	an adaptive response to classroom demands and school learning tasks	ADHD Rating Scale	Attention problems: is easily distracted, doesn't seem to listen
			School Readiness Inventory	Classroom participation: self-regulation, learning motivation, and conscientiousness
Stipek, Newton, & Chugar (2010)	Learning-Related Behaviors	sitting still, working independently, and listening to the teacher	Teacher Rating Scale of School Adjustment	Works independently, seeks challenges, accepts responsibility and

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
				tuned into what is going on in the classroom
Sung & Wickrama (2018)	Approaches to Learning	a constellation of students' learning-related behaviors and dispositions	ECLS-K Approaches to Learning Scale	
Tan & Dobbs-Oates (2013)	Approaches to Learning	attention problems, initiative, and self-control	Devereaux Early Childhood Assessment	Self-Control Initiative
Vitello, Greenfield, Munis & George (2011)	Approaches to Learning	Adaptive learning behaviors, such as motivation, persistence, frustration tolerance, initiative, and positive disposition towards learning	PLBS/LBS	
Observation-Based Measures of Approaches to Learning				
Chen & McNamee (2011)	Approaches to Learning	initial engagement, attention, planfulness, and goal orientation	Observation-based method with coding	
Nesbitt, Farran, & Fuhs (2015)	Learning-Related Behaviors	Level of involvement Sequential learning behaviors Social-learning interactions	Child Observation on Preschool (COP)	the ability to attend to and be involved in learning-related activities, engage in sequential learning-related activities that

Study	Term used	Operationalization	Measure of AtL	Subscales or sample items
		Unoccupied and disruptive behaviors		require remembering and enacting multiple steps, cooperate and interact with peers and teachers on learning-related activities, and refrain from unoccupied/disruptive behaviors that reduce learning opportunities
Vitello & Greenfield (2017)	Approaches to Learning	skills and dispositions, including curiosity, engagement, flexibility, persistence, frustration tolerance, and self-direction	inCLASS	Engagement: maintain focus in an activity and demonstrate interest and enthusiasm Self-Reliance: independently seek out activities or to persist calmly in the face of difficult tasks
Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock (2009)	Global Ratings of Engagement	Engagement in learning	Observed Child Engagement Scale	Compliance, engagement, self-reliance, negative affect attention, peer cooperation, disruptive behavior, and positive affect

Note. *PLBS is the Preschool Learning Behaviors Scale. ECLS-K is the Early Childhood Longitudinal Study-Kindergarten cohort.*

[1] See also Holliday, CImetta, Cutshaw, Yaden, and Marx (2014)
[2] See Also Harrison, McLeod, Berthelesen, & Walker (2009)
[3] See Also Dominguez, Vitiello, Fuccillo, et al. (2011)
[4] See also Hindman & Morrison (2011) and Son, Kwon, Jeon, & Hong (2013),
[5] See Also McDermott, Leigh & Perry (2002), McDermott et al. (2017), McDermott, Rikoon, Waterman, & Fantuzzo (2012) and Fantuzzo, Perry, & McDermott (2004) for similar definitions of AtL with the LBS or the PLBS

MANUSCRIPT II

Exploration and Dramatizing: Theoretical Foundations for the Development of Approaches to Learning through Play

This manuscript is prepared for submission to the peer-reviewed journal *American Journal of Play* and is the second of three manuscripts prepared for a journal-ready doctoral dissertation.

Abstract

Approaches to Learning (AtL) is a construct widely included in many state standards for PreK as a process-oriented disposition describing *how* children learn. Play is one pedagogical strategy teachers can employ to support the development of AtL. This paper used Vygotsky's depiction of two kinds of play, object play and pretend play, to provide the theoretical framework to articulate the links between play and AtL. Exploration through object play supports children's development of working theories, which, in turn, help children develop curiosity and problem-solving. Dramatizing through pretend play helps children develop symbolic representation necessary for imagination and creativity. Both kinds of play require intentional teacher scaffolding. This paper concluded by presenting ways in which teachers can encourage object and pretend play in the classroom.

Keywords: Play-as-learning, working theories, Vygotsky, amplification, scaffolding

Exploration and Dramatizing: Theoretical Foundations for the Development of Approaches to Learning through Play

Despite the often-used phrase, play is children's work, the status of play's role in learning has shifted in the past 20 years. Research has shown that children's play is less mature, teachers are offering fewer opportunities for play, and U.S. educational policies emphasizing academic learning have resulted in reduction of play as a pedagogical approach (Bodrova & Leong, 2019; Gleave & Cole-Hamiltion, 2012; Smirnova & Gudareva, 2015). Although this research is presented sequentially, the cause-effect relationship among these elements is not known. Currently, children have less unstructured playtime and fewer opportunities to engage in complex play with more competent or experienced peers (Bodrova & Leong, 2019). During the preschool period, when children's play should be at its peak performance, current observations indicate it typically resembles the immature play of toddlers and younger preschoolers (Bodrova & Leong, 2015). Preschoolers may play in short bursts before quickly moving onto a new area, use toys that more closely resemble real objects, or continually repeat the same play scripts (Bodrova & Leong, 2019).

The introduction of standards and policies (i.e., No Child Left Behind) aimed to increase academic achievement have restructured the role of play in the classroom (Brown, Ku, & Barry, 2020; Nilsson, Ferholt, & Lecusay, 2018). By 2009, most states enacted early learning standards for young students that included literacy and math standards tightly aligned with K-12 standards (Bracken & Crawford, 2010). Bassok, Lantham, and Rorem (2016) tracked kindergarten practices from 1998 to 2006, when the standards movement came to the fore, finding a definite move towards direct instruction, a focus on curriculum involving literacy and numeracy, and a decrease in play-based activities. In a study comparing the implementation of preK standards in

two different states, researchers found that wherever possible, decision-makers in both states worked purposefully to ensure that students had the academic skills to be successful in kindergarten, often de-valuing the role of play in preparing children for kindergarten (Graue et al., 2017).

Finally, both research and practice have begun to support the idea that teachers should take a more active role in guiding and participating in children's play (Weisberg, Hirsh-Pasek, & Golinkoff, 2013). Rather than providing unstructured playtime, which "alone will not be sufficient to help children learn important information, adults must provide scaffolding to constrain the potential interpretations and possibilities" (Toub, Rajan, Golinkoff, & Hirsh-Pasek, 2016, p. 134). Utilizing Vygotsky's work, Nilsson et al. (2018) describe scaffolded play as *play-as-learning,* wherein teachers use play as a pedagogical technique.

A more balanced approach that emphasizes play and academics may be most beneficial for children (Claessens, Engel, & Curran, 2014). Play-as-learning provides a theoretical framework for teachers to purposefully use play to introduce academic content in developmentally appropriate ways. By using play, which is generally process-oriented, teachers are also able to encourage the development of learning-to-learn skills and to support children's role as learners. Given that many current standards, such as Common Core and the Head Start Guidelines, include standards that focus on *how* children learn as well as what they learn, teachers can use play as a way to support both content and process (Toub et al., 2016).

Indeed, the theorist Lev Vygotsky (1967, 2004) highlighted the critical role of play in the learning of preschool-aged children. He argued that through adult-scaffolded play, children developed the underlying social and cognitive competencies necessary to become self-regulated learners when they entered formal schooling. In particular, pretend play and exploration of

objects helped children develop underlying higher-order thinking skills, like problem-solving and creativity. While he used the term imagination to describe the process-oriented thinking skills developed through play, his ideas are also captured in the term Approaches to Learning (AtL). His theory describes how play supports children's academic and underlying social/emotional competencies.

The purpose of this paper is to describe AtL as it is currently represented in the research and literature and to articulate how, through engaging in purposeful play, children develop underlying learning skills that support the acquisition of academic content. Vygotsky's work serves as the theoretical framework explaining how play develops children's AtL. Finally, the ways in which teachers can help develop children's AtL through scaffolding play is also discussed.

What is Approaches to Learning?

In 1995, the National Education Goals Panel (NEGP) set the goal that by the year 2000, all children would come to kindergarten ready to learn. In support of this goal, they identified five different domains of school readiness competencies: social/emotional development, physical development, cognitive development, language, and approaches to learning. Approaches to learning (AtL) is an umbrella construct for learning behaviors that facilitate children's successful interaction with teachers and peers in a school setting (Fantuzzo et al., 2004; McDermott et al., 2018). Rather than a set of discrete, pre-academic skills, AtL is a set of readiness *for* learning behaviors, including flexibility, curiosity, problem-solving, and creativity. These behaviors have consistently been linked with academic success, and so represent foundational skills for children (Li-Grining, Votruba-Drzal, Maldonado-Carreno, & Haas, 2010; McDermott et al., 2014). However, it is important to note that the NEGP described AtL as influenced by diverse cultural

values and practices which dispose children to go about learning in diverse ways (Chen, Masur, & McNamee, 2011).

To date, AtL includes a wide variety of skills that vary from study to study (Fantuzzo et al., 2007; Stipek et al., 2010). Many studies define it as classroom-based behaviors that promote learning (Bierman et al., 2009; Cerda et al., 2014; Fantuzzo et al., 2007; Razza, Martin, & Brooks-Gunn, 2012). As such, AtL is not content-specific but focuses on how children learn across various tasks and go about the classroom in an effortful and purposeful way (Chen & McNamee, 2011). AtL has also been described as a set of domain-general skills (Bustamante, White, et al., 2018). As such, ATL explains *how* children learn rather than how well they learn (Razza et al., 2015). Some researchers have highlighted the cognitive aspects of ATL, focusing on AtL as planfulness and goal orientation (Fantuzzo et al., 2007), while other researchers believe that it is a combination of affective, cognitive, and behavioral skills (Fredricks et al., 2004).

AtL is widely included in many state standards for preK and the Head Start frameworks for learning (Barbu et al., 2015). Many standards reflect the NEGP's emphasis on process-oriented AtL, including Wisconsin and Hawaii (see Table 1). Curiously, many of the state standards include play under the standards for AtL. South Dakota includes play and imagination as subdomains of AtL, while Louisiana includes a standard for dramatic play as a way to engage in creative thinking. These states also include exploration with objects to obtain information about the world. Washington state includes having children learn by doing hands-on exploration, while Oklahoma advocates through active exploration, including trial and error.

Table 1

State Standards for Approaches to Learning

State	Domains	Sample
Wisconsin	Curiosity, Engagement, and Persistence Creativity and Imagination Diversity in Learning	A.EL. 1 Displays curiosity, risk-taking, and willingness to engage in new experiences.
		B. EL. 1 Engages in imaginative play and inventive thinking through interactions with people, materials, and the environment
South Dakota	Curiosity, Information-seeking, and eagerness Initiative, Effort, Engagement, and Persistence Risk-Taking, Problem-Solving, Flexibility, and Resiliency Play and Imagination	AL-1. Demonstrate an eagerness to find out more about other people, discover new things in their environment, and talk about these things with others. AL-2. Purposefully try different ways of doing things to see how they work (adjust blocks used as a ramp to make a ball roll faster and farther).
		AL-8. Engage in make-believe play with imaginary objects. AL.9 Use materials (art materials, instruments, construction, writing implements) or actions to represent experiences or ideas in inventive ways.
Louisiana	Initiative and Curiosity Attention, Engagement, and persistence Reasoning, Problem-Solving, and Creative Thinking	AL 3. Recognize, understand, and analyze a problem and draw on knowledge or experience to seek solutions.
		CC 3. Explore roles and experiences through dramatic art and play.
Oklahoma	Positive Attitudes, Habits, and Learning Styles	A. Demonstrates eagerness and interest in learning I. Recognizes and solves problems through active exploration, including trial and error, interactions, and discussions with peers
Washington	About Me and my family/culture Building Relationships Touching, seeing, hearing and moving around Growing up health Communicating Learning about my world	Learning About my World. Children may: • Ask a lot of “why” and “what” questions. • Learn by doing hands-on and through the senses and play • Recall several items after they have been put out of sight. • Draw on own past experiences to choose current actions. • Make plans for ways to do something. May or may not follow through.

		• Think of a different way to do something, when confronting a problem, with adult help. Play with materials of different texture (such as sand, water, leaves) and conditions (such as wet, dry, warm, cold), with adult encouragement and supervision.
	Initiative and Creativity Persistence and Attentiveness Problem-solving Reflection and interpretation Effective and ethical technology	Begin to think problems through, considering several possibilities and analyzing results (AL/LA.KE.d)
		Use knowledge of everyday experiences to apply to a new situation (AL/LA.KE.f)

What is evident through research and a review of the state standards is that AtL represents a critical component of school readiness as a process-oriented disposition. Yet exactly how do children develop AtL through play? Furthermore, how does AtL support children's process-oriented thinking skills in more formalized learning situations? Using Vygotsky's work, the following sections will consider the role of play in young children's development. Then, specific features of children's play will be linked with the development of process-oriented skills. Finally, AtL as a bridge between play and children's academic outcomes will be explored.

Play as a Leading Activity

Vygotsky, utilizing a cultural-historical view, believed play developed from the experiences and social interactions children undergo (Bodrova, 2008; Holzman, 1995; Oers & Duijkers, 2013). He described play as a leading or primary activity driving preschool-aged children's development (Elkonin, 2005). *Leading activities* consist of "the activity on which the main psychological changes in the quality at a given period of development depend in the closest way" (Leont'ev, 1981, p. 396). Rather than internally driven psychological structures, such as mental schema, leading activities focus on culturally-mediated interactions as the mechanism for developmental change (Bodrova & Leong, 2015). They support the most critical changes that take place within the child's mind and pave the way for the child to transition into a new, higher role in society (Duncan & Tarulli, 2003; Fleer, 2011a; Rogoff, 2003). For preschool-aged children, play as a leading activity prepares children to transition to school, the next phase of life, (Leont'ev, 1981).

Leading activities are not universal. They are culturally specific and depend upon the historical conditions in which the child's development is taking place. In Western societies, children are often sheltered from the world of adults, and thus use play to make sense of the

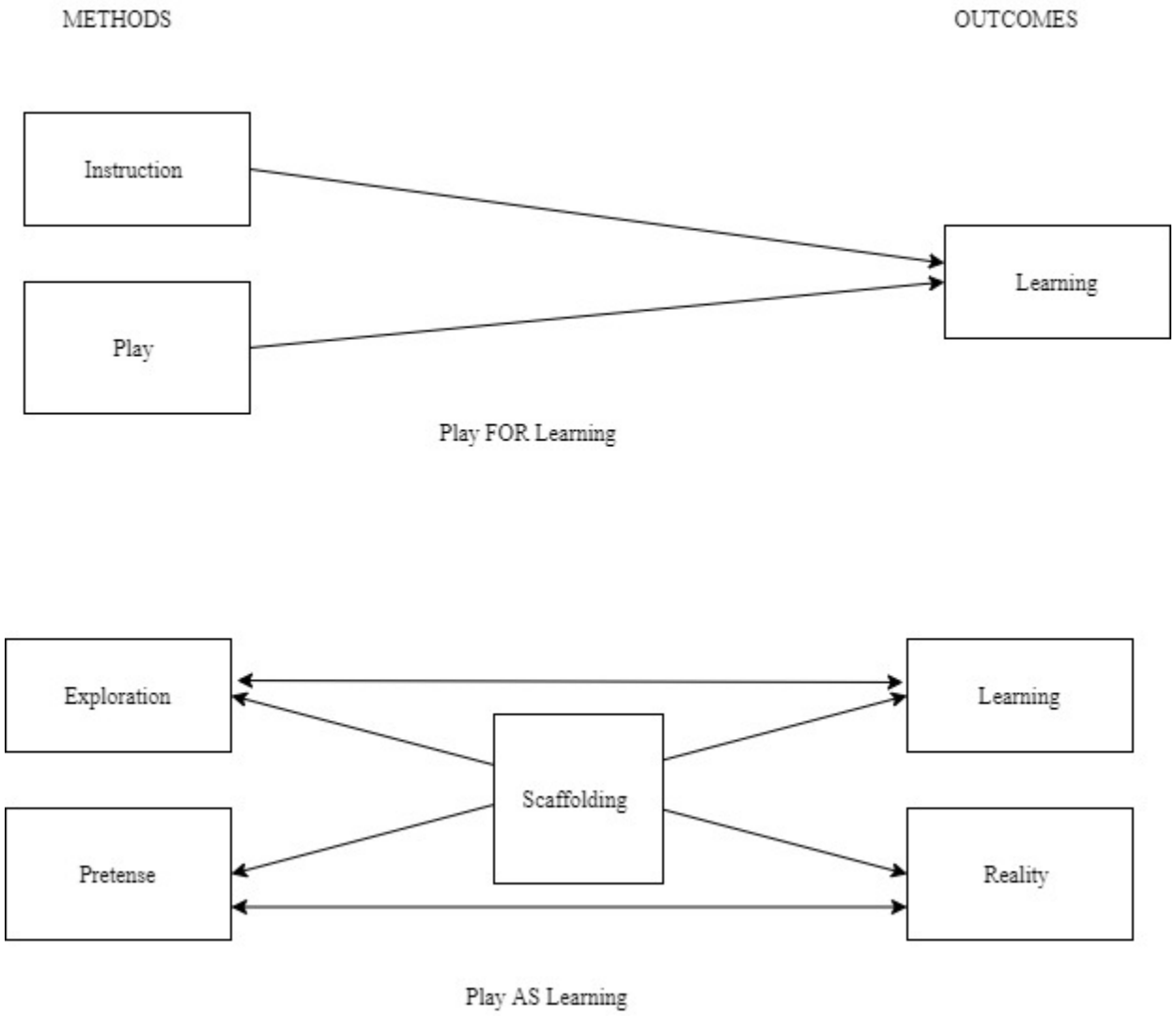
world around them (Bodrova & Leong, 2015). They acquire understanding through engaging in activities of the culture, such as household work, mealtimes, games, and storytelling (Vygotsky, 1967). They also use pretend play to re-enact adult roles (Berk, Mann, & Ogan, 2006). Thus, participation in daily activities is the culturally mediated context through which children learn.

Play is also a leading activity because it enables children to experiment with a wide array of challenging skills (Vygotsky, 1967). It is not the result of children's naturalistic tendencies, but rather a cultural-historical phenomenon dependent upon the quality and degree of adult mediation. His focus on interaction distinguishes his theory of play from others who view play from a maturational view, where play progresses as the child ages (Fleer, 2011a). With adult scaffolding, a child in play is "…a head taller than himself, above his usual everyday behavior" (Vygotsky, 1978, p. 74). According to this view, play draws a child forward to a level of activity beyond what she can accomplish on her own (Bodrova & Leong, 2005; Bredekamp, 2004).

Through play, children were able to participate in activities that naturally supported their academic development, i.e., learning about quantity through cooking or patterning through songs (Vygotsky, 1967). However, more recent understandings of play have separated play and instruction in children's development. Teacher instruction is the primary driver of learning (see Figure 1). Nilssom et al. (2018) describe this as play-for-learning, wherein play is primarily a means to an end (i.e., learning). Children may be able to learn through play; however, it is embedded in an instructional goal, e.g., playing math games to support number sense.

Figure 1

Conceptual Model of the Relationship Between Play and Learning



In Vygotsky's theory, learning and development were interconnected, with play as the primary mechanism for the development of both, in play-as-learning. From this perspective, play and learning are bi-directional: play leads to learning, and learning enhances children's play. Adults scaffold play by structuring and participating in play. Involvement in play provides opportunities for children to develop the culturally-mediated knowledge and skills to be a successful learner.

As will become evident throughout this paper, Vygotsky envisioned pretense leading to learning and the exploration of objects leading to an understanding of reality. Importantly, both exploration and pretense require adult scaffolding. This view of play stresses the teacher's role as a mediator between pretense and reality (Karpov, 2014). The next section describes the way that exploration leads to an understanding of reality through the development of working theories as well as the role of pretend play in the development of symbolic representation.

The Development of Working Theories Through Exploration

The development of AtL through play occurs with two different styles of play, exploration and dramatizing. Although these styles are discussed separately, children will shift between both styles of play, and both are necessary (Creaser, 1990). Exploration or object play supports process-oriented dispositions, including curiosity and problem-solving, which lead to science and math understanding (Fleer, 2009). Dramatists' creation of pretend scenes encourages them to make meaning through interactions with others by developing imagination and flexibility that supports their literacy and math development (Duncan & Tarulli, 2003; Fleer, 2018).

During construction or object play, children acquire information about the tactile and physical properties of objects through tinkering, manipulating, and decomposing (Miller & Almon, 2009). Children begin with everyday utensils, natural materials, or other found objects. They build, manipulate, investigate, and ask questions (Solis, Curtis, & Hayes-Messinger, 2017). Rather than use the objects in pretense, children are genuinely interested in the objects and their properties.

Young children's object play helps them to develop an understanding of the world around them (Eshach & Fried, 2005). When children explore with objects, they are not interested in making something happen but rather trying out *whether* things can happen (Foreman, 2006).

Playing with objects allows children to observe phenomena that call for explanations, which they try to formulate (either implicitly or explicitly) by testing object properties and structure (Wolfe, Cummins, Myers, & Cedillos, 2006). It also helps children to test hypotheses and understand causal relationships (Bjorklund & Gardiner, 2011).

However, object play also supports children as they make sense of more than just the physical properties of individual objects (Solis et al., 2017). Play with blocks helps children understand both how objects fit together in physical space and how to represent and manipulate objects mentally. As children play more with objects, they understand how objects may be similar and different, and they are able to link objects together by categories. They also create mental representations of objects that will provide the conceptual foundation of language development (French, 2004). For example, after exploring with buttons, beads, unifix cubes, and blocks, children understand that five buttons, five blocks, and five cubes are all the same quantity (Carlsson-Paige, 2008).

The hypotheses and conceptual knowledge around everyday objects that children develop through object exploration is what Vygotsky (1987) termed *everyday knowledge* (also called informal or spontaneous knowledge). It is created without explicit instruction through interactions with adults (Worthington & van Oers, 2016). In the home, it can include routines, cultural practices, and concepts about objects found around the home (Fox & Riconscente, 2008; van Oers, 2010). Young children develop informal knowledge when adults react and interpret these actions as meaningful (Vygotsky, 2004). These interactions with adults or peers help to connect objects, concepts, and language (Rudd, Lambert, Satterwhite, & Zaier, 2008). For instance, a mother and her infant daughter are eating together, and the daughter points to her plate. The mother responds, “oh, you want more?” and brings the child more food. This adult

mediated interaction helps the child develop the concept of quantity. The daughter's informal knowledge of more is refined a few years later when the mom and daughter are playing with marbles. The child may say, "I want more marbles." The mother responds, "how many more?" or "here are five more," extending the concept of more to a specific numeric quantity.

In the classroom, children's object exploration creates working theories that can be used to develop more formal, scientific knowledge (Fleer, 2009; Hedges & Cullen, 2012). Children's experiences help them shift from concrete experiences to abstract concepts and vice versa (Anastasiou, Kostaras, Kyritsis, & Kostaras, 2015). Scientific concepts can be taught, provided children have had time to develop working theories (Fleer, 2011a). As an illustration, children can engage in water play to develop an understanding of concepts such as liquids and measurement (Hamlin & Wisneski, 2012). This understanding provides an essential context for children to develop the scientific notion of volume (Bodrova & Leong, 2007). Once children understand volume, they can refine their understanding of liquid by testing how to measure the volume of different liquids.

Exploration with objects helps children acquire an understanding of the way the world works, including both the properties of objects but also how objects can be linked to concepts (Vygotsky, 1978a). Adult scaffolding extends children's object play by linking children's explorations to more scientific understandings (Hamlin & Wiskneski, 2012). Through experiences and discussions, adults can further connect children's hypotheses to formal concepts.

The Development of Symbolic Representation Through Dramatizing

To propel development forward, dramatists engage in pretend play with specific characteristics: an imaginary situation, the enactment of roles, and a predetermined set of rules

related to the roles and situations (Elkonin, 2005). Children's first attempt at pretend play typically involves the symbolic representation of objects closely matching the object they represent, for example, pretending to drink from a toy cup (Duncan & Tarulli, 2003). With practice, these objects can become more abstract until they bear little physical resemblance to the objects they symbolize (Bodrova, 2008). Children also use gestures to represent actions associated with objects. In this case, a flick of the wrist can indicate writing on a piece of paper.

During make-believe play, a child acts out a role by synthesizing what the child believes to be the behavior of adults in that role. Children replicate the language, actions, thinking, and emotions of the doctors, mommies, or chefs they are representing (Vygotsky, 2004). They recombine and re-invent roles based on input from others and themselves, integrating both realistic thinking and fantasy (Fleer, 2018). As Vygotsky (2004) described it, "a child's play is …a *creative* reworking of the impressions he has acquired. He combines them and uses them to construct a new reality (p. 11-12; emphasis in original). Rather than an exact replication, these roles are a general model of the child's version of mommy-ness or doctor-ness, comprised of the creative reworking of the impressions he or she has acquired (Nilsson et al., 2018).

Finally, rules are the sets of behaviors allowed by the role in the scenario. For example, a doctor must check the patient, attempt to diagnose the illnesses, and then prescribe medication or treat the patient. These rules are hidden or unexpressed in the beginning. Children expect specific vocabulary and actions to be present during doctor play and might protest if the doctor suddenly began making pizza or using gardening tools. Later, as children's language develops, they discuss and negotiate the rules (Bodrova & Leong, 2007).

One of the developments emerging from complex pretend play is symbolic representation (Vygotsky, 1967). Through pretend play, children explore the relationship between a sign (e.g.,

symbol, scribble, object) and its meaning (van Oers, 1994). Vygotsky used the word pivots to describe how children used objects as alternate possibilities (Hao & Fleer, 2016). As physical objects, pivots act as a placeholder of an imaginary object in a child's play. Children begin to try out the new meaning of the object, emphasizing the abstract meaning behind the object rather than the object itself (Nilsson et al., 2018). Language and the shared cultural context help children co-create meanings through objects. For example, children use blocks to represent food items at a restaurant because they understand the roles of the server, cook, and patron (Fleer, 2011b).

As children co-construct symbolic meaning, the basis of language as a symbolic tool is crystallized. Symbolic representation helps children as they organize their experiences and expand their understanding of the world (Emfinger, 2009). Children may use gestures, drawings, words, or scribbles to represent ideas. For example, once children have constructed an idea about "three," they invent symbols to represent this knowledge, often through marks on a paper that bear little resemblance to the numerals they represent (van Oers, 1994). Over time and with input from others, children's representations become more conventional. In addition, they develop the ability to imbue more conventional meanings on objects (Worthington & van Oers, 2016). Having explored how blocks can serve as walkie-talkies helps children as they make the leap that a centimeter block can represent a unit of measurement or a place value block can represent a quantity.

Symbolic language, developed through pretend play, will be vital as children acquire literacy and math concepts, as summarized in Table 2. Pretend play encourages children to develop more sophisticated, abstract understandings (Ginsburg, Lee, & Boyd, 2008). Adult scaffolding plays a critical role in supporting children's development from pretense to learning

(Devi, Fleer, & Li, 2018). Adults can take an active role by entering children's play as a model for the roles children will enact (Hakkarainen, 2010).

Table 2

Summary of Types of Play

Type of Play	Examples	Concepts Acquired	Teacher's Scaffolding
Exploration	Block Play: A child aims to build the tallest tower but uses long blocks on the smallest end.	Working Theories About: • Cause and effect—if I stack the blocks this way, this happens • Properties of objects—some blocks stack easier or are more stable	• Asking the child why the blocks are falling • Encouraging the child to continue to try alternate solutions or strategies
Dramatizing	Children are in the dramatic play center which has props for children to engage in "Grocery Store Play."	Symbolic Representation as • Pieces of paper used as money • Receipts or store signs • Purchasing a specific quantity of items • Representing abstract quantities—asking customers if they want more or less of something • Using numerals in price tags • Making change from purchases	• Being a customer in the store • Extending play by providing additional play props and explaining their use (scales, paper for signs)

Approaches to Learning as a Bridge Between Play and Learning

The previous sections highlighted how children's object exploration helps to develop working theories about properties and causal structures and how pretend play helps to develop

symbolic representation. Engaging in both exploration and dramatizing contributes to the development of process-oriented, learning-to-learn skills, such as AtL. Exploration and dramatization support the development of AtL subdomains like curiosity, problem-solving, persistence, and flexibility primarily by enabling the child to move freely between reality and pretense (see Table 3). While these skills are often discussed as discrete dimensions, it is essential to recognize that they are process-oriented skills that are dynamically interwoven and difficult to tease apart (Carr & Claxton, 2002). In the examples below, the elements of AtL serve as a bridge to support children's meaning-making.

Problem Solving, Flexibility and Curiosity

By engaging in object exploration, children develop curiosity and problem solving that helps them understand reality (i.e., develop working theories). Young children are often deemed

Table 3

Summary of Meaning Making

Types of Play	How Children Make Meaning	Element of Approaches to Learning
Exploration	Exploration→Reality	Curiosity Problem Solving and Persistence Flexibility
Dramatizing	Pretense→Learning	Imagination and Creativity

naturally curious: they ask questions and explore their environment to understand the world around them (Chak, 2007). Curiosity compels children to touch, taste, smell, and discover. An initial interest in ladybugs may prompt children to ask questions about what they eat, where they live, etc. Persistence and problem-solving often co-occur. Persistent thinkers take risks and are willing to engage in trial and error to verify their results. Persistence involves maintaining focus on and investing energy into a task. It may include following a series of steps to complete a

project, setting a goal, or continuing despite frustration. It also describes the strategies a child may use to overcome a difficult task (Chang & Olson, 2016).

While children are naturally curious problem-solvers, they need interventions from adults to direct their curiosity into testable hypotheses. Children's initial curiosity may lead them to ask questions, including "why is the grass green?" which may be challenging to explore. However, as children are given more opportunities, they can develop more sophisticated questions and testable hypotheses, such as "what are the ways I can get water to move?" (Chalufour & Worth, 2005). Children learn how to persist through trial and error and to create models to represent their thinking (Bustamante, White, et al., 2018).

Another aspect of AtL is flexibility. Flexible thinking helps children to consider a problem from multiple perspectives, adjust their approach to new information, or plan the next steps. In young children, flexible thinking often includes being able to apply or combine existing knowledge in new ways (National Research Council, 2012). As children engage in object exploration, they continue to refine their working theories about the way the world works by combining initial hunches with new data. As children enter formal schooling, this ability to flexibly combine knowledge will be critical as they refine their thinking given more formal or scientific theories.

Imagination and Creativity

Engaging in complex pretend play helps children develop the imagination and creativity necessary to understand the more abstract world. Vygotsky (2004) described imagination as having a dual role in moving children between reality and pretense, and as such, serves as a bridge between play and learning. Through pretend play, children develop the underlying cognitive abilities to assign meaning to objects and people (Fleer, 2011a). This ability to re-

imagine information will support children as they understand the more formal symbolic representations in school—letters, numerals, place value, gravity, etc.

Imagination is a generative mental activity that allows children to create new ways of thinking (Bodrova & Leong, 2006). Through pretend play, children impose meaning on an object—the block becomes the walkie-talkie. Children rely on their imaginations to see the object not just as a block but as whatever meaning they have assigned to that object; children move further from physical reality as they use their walkie-talkie in play. Inversely, children imbue meaning when they enact roles during pretend play that moves them towards reality. Children use pretend play to examine the rules associated with that role, such as being a police officer or construction worker. Children then use their imagination to envision a situation to play out that role. Early play may focus on being a police officer and everything that is involved in police work. However, as play advances, children focus on adventures the police may have as they fight crime together; the rules associated with the role are less important. Imagination helps support these transitions between reality and fantasy, just as AtL helps support children's learning through interactions with materials and adults.

Through play, children develop process-oriented skills, including curiosity, flexibility, problem-solving, and imagination. These learning-to-learn skills serve as underlying competencies that support children's efforts to learn in the classroom. Vygotsky's cultural-historical theory highlights both how and in what context children develop AtL. Through pretend play in the grocery store, children develop problem-solving and creativity to create a system of buying and selling based on hand-written tickets symbolizing money. They understand both the process of exchange as well as how to explain that process to others. Through engaging in both kinds of play, children participate in social contexts that teach children how to learn. However, to

reap the maximum benefits of play, teachers must be able to provide opportunities for children to engage in these experiences and appropriately scaffold their play. In particular, teachers can scaffold children's exploration through inquiry-based science activities and pretend play related to different roles in the classroom.

Amplifying Approaches to Learning

Play potentially fulfills a critical role in advancing children's persistence, problem-solving, imagination, and creativity. However, not all play will lead to optimal developmental outcomes that boost children's school readiness (Bodrova & Leong, 2005). To support the development of AtL, it is not merely a matter of offering children materials to engage in play or allowing for free play in between academic sessions (Scharer, 2017). Educational practices should integrate play into the curriculum in structured ways that support children's initiative and creativity (Nicolopoulou, Barbosa de Sa, Ilgaz, & Brockmeyer, 2009). Zaporozhets, a student of Vygotsky, described this kind of curriculum as the *amplification* of child development, wherein particular curricula promote children's development through activities uniquely suited to children's capabilities, i.e., leading activities (Bodrova & Leong, 2005).

Children's AtL can be amplified in today's curriculum through play-based activities, which encourage them to explore and engage in dramatic play. Teachers' use of play-based curricula provides the essential scaffold to support the development of AtL (Stone, 2017). While play provides a rich context for children to improve their imagination, self-regulation, and other school readiness skills, to truly become a head taller in play, children need intentional adult scaffolding to help infuse meaning through play (van Oers, 2010). The examples that follow demonstrate how teachers can scaffold children's object exploration and dramatic play in ways that nurture AtL. Ultimately, in Vygotsky's *play AS learning*, teachers can scaffold children's

play to support readiness for learning (Ginsberg, 2006; Stipek, 2006; Worthington & van Oers, 2016).

Using Scientific Inquiry to support AtL

Engaging in scientific exploration allows children can test out different hypotheses, explore alternative theories, and create models of their thinking, all process-oriented skills supported by AtL (Bustamante, Greenfield, & Nayfeld, 2018). Children's play provides many opportunities to explore scientific concepts naturally and to develop everyday knowledge (Worth, 2010). At its core, inquiry-based science is "exploration of phenomena and materials" (Worth, 2010, p. 3). By engaging in exploratory play, children can develop inquiry skills, such as observing, asking questions, providing explanations, interpreting, and sharing ideas (National Research Council, 2000). As the first steps in the process of inquiry, children often notice and wonder why. Children may first observe how balls roll down ramps and wonder why this is so. This noticing and "mere looking" is essential (Eshach & Fried, 2005, p. 320). In addition, the scientific process involves cyclical thinking as children test ideas, refine theories, and re-test. Continued exploration of ramps or balls of different sizes helps children develop an understanding of force and motion (Hamlin & Wisneski, 2012).

Scaffolding children's inquiry-based explorations helps children develop working theories. Hamil and Wisneski (2012) describe how one group of children developed an understanding of exoskeletons by examining cicada shells found on the playground. Children wondered if the shells were alive or dead, and sought an answer by touching, squeezing, examining with a microscope, and rubbing the shells onto other objects. The teacher provided books about insects and different exoskeletons for the children to compare. She also encouraged children to draw what they found in books and on the playground to represent their

understanding. These models helped children refine their thinking about living animals while also supporting their understanding of more scientific terminology about the characteristics of insects.

Another example is provided by Chalufour and Worth (2005) in their description of a unit on children's exploration with water. In this example, the teacher scaffolds the children's attempt to answer the question, 'how can I make water move?' At the water table, children are first provided with materials that support their exploration of water movement: funnels, rubber tubing and connectors, and a wire water wall, a structure that allows children to hold funnels and tubing securely at various spots in the water table. Children may have developed prior working theories about ways to make water move through physical movement or blowing. However, as children explore the water wall, they discover how the water level impacts the amount of water and air necessary to move water. They begin to ask more refined questions, such as "what makes water move fast or slow" or "how can I move water up?" They also begin to plan, predict, take action, and reflect on what happened (Worth, 2010). This kind of exploration provides multiple opportunities to develop AtL by encouraging children to problem-solve (how can I use different containers to get water from one spot to another?) and persist through spills and setbacks.

Enacting Roles in the Classroom

Pretend play presents a rich environment for children to practice and act on what they have seen in the environment (Munn & Schaffer, 1993). It also provides multiple contexts for the development of process-oriented skills when teachers take opportunities to capitalize on content-oriented concepts inherent in many children's play. Children can extend abstract ideas about number because they have tested relationships between objects through play (Paz-Albo Prieto, Cvencek, Herranz Llácer, Hervás Escobar, & Meltzoff, 2017; Sarama & Clements, 2009).

By encouraging children to make meaning through their pretend play, teachers can support the development of imagination and creativity (Perry, Young-Loveridge, Dolckett, & Doig, 2008). One activity described by Karpov (2014) is architects, builders, and building inspectors. The teacher encouraged the children to be architects (to draw houses), builders, who looked at designs and created houses, and building inspectors, who ensured that the house or castle matched the drawings. Children developed their symbolic representation by using blocks as substitutes for objects and using drawings as substitutes for block configurations. The building inspectors used both kinds of representations to check them against one another. As children enacted roles as architects, they developed creativity by representing buildings as houses, castles, apartments, or cabins. As builders, they imaginatively re-created an object or building that they have seen, both with blocks and on paper.

In another activity, described by Nicolopoulou et al. (2009), children engaged in storytelling/story acting. Children dictated a story to the teacher, who wrote it down as the child told it. At a later period, the stories were read aloud by the teacher, while the child acted out the story. This activity required children to be able to use their imagination in telling stories and in re-enacting stories using props available in the classroom or through gestures. Children also engaged in creativity as they re-imagined and retold parts of other children's stories, fairy tales, and other media in ways that worked for their own purposes. As children engaged in storytelling/story acting, they heard and developed their sense of the arch of a story, along with other oral language skills.

In many dramatic play scenarios, teachers can work with children to provide opportunities to encourage symbolic representation (Wager, 2013). Often, representing ideas or concepts through writing builds creativity by requiring children to make their understanding

visible (van Oers, 2010). Worthington and van Oers (2016) described a pretend play scene with a child, Ayaan, who operated an ice cream store in the outdoor gazebo of their classroom. To denote ice cream orders, the child "drew dashes in a notebook without comment" (p. 263). Teachers can encourage children's play by asking children like Ayaan to describe their marks on the page or read back the order.

Adults play a critical role in supporting children's pretend play by scaffolding children in how to use reality to represent imaginary situations and how to use exploration to develop working theories. These curricula highlight the central role of adults in interacting with children to facilitate play. Indeed, without these social interactions leading the development of imagination, children's play may not advance to more complex, mature forms (Elkonin, 2005). Inquiry-based curriculum and practices like storytelling/story acting can support children's AtL and prepare them for formal schooling.

Conclusion

The role of play in preK classrooms is in a state of flux, with some advocates favoring more academic approaches to prepare children for K-12 (Graue et al., 2017). Rather than present play and learning as dichotomies, theorists, like Vygotsky, see the interconnection. Play is precisely the activity designed to develop underlying social and cognitive competencies that will enable children to learn as they go onto first grade, and as such, children should spend more time engaged in play, not less (Bodrova & Leong, 2019; Bodrova, 2008). Vygotsky (1978) argued, "we need to concentrate not on the *product* of development but on the very *process* by which higher forms are established" (pg. 64; italics in original). Play was the very process through which children developed higher-order thinking that would, in turn, lead to the acquisition of more formal academic knowledge in school.

High-quality play supports children's process-oriented thinking and content knowledge. Indeed, children naturally explore science and math concepts during play (Seo & Ginsburg, 2004; van Oers, 2010). While children are curious and eager to play, teachers must be prepared to engage children in rich play-based experiences that support process-oriented dispositions, rather than adopting curricular approaches that emphasize skills in isolation (Sarama & Clements, 2009). Table 4 highlights the overlap between PreK content standards and math and science process standards, emphasizing how, by developing AtL, teachers can help children develop content skills.

Table 4

Alignment of Play, AtL, and Academic Standards

	Curiosity	Problem Solving	Imagination	Creativity
Georgia Early Learning and Development Standards	APL1.3a. Initiates new task by himself	APL1.3c. Makes plans and follows through	APL5.3a.Uses imagination to create a variety of ideas, role-plays	APL5.3c.Finds creative ways of doing a familiar task
Common Core Standards for Mathematical Practice	Make sense of problems and preserve in solving them	Reason on abstractly and quantitatively	Model with mathematics	Look for and make sure of structure
Next Generation Science Standards	Ask questions based on observations to find more information	Define a simple problem that can be solved; analyze data from tests to determine of tool worked	Develop a simple model based on evidence to represent a proposed object or tool	Use tools to build a device that solves a specific problem; compare multiple solutions

Note: Georgia Early Learning and Development standards available at http://gelds.decal.ga.gov/Default.aspx. Common Core Standards available at http://www.corestandards.org/Math/Practice/. Next Generation Science Standards are available at https://www.nextgenscience.org/sites/default/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf

At the classroom grocery store, children have opportunities to read grocery lists, write signs, count and make change, bag groceries, and interact with other shoppers at the store. Along

the way, they will learn how to recognize numbers and letters, how objects fit together, how to classify vegetables and fruits, how to count, take turns, and share. However, they also develop critical learning dispositions, including initiative, problem-solving, flexibility, and persistence, as they create props, sustain play, and maintain roles of cashier and shopper. These dispositions help students transition into the role of learner. Children will be best prepared to enter formalized school as readers, writers, scientists, and mathematicians if they first have time to explore and dramatize, which can be accomplished in classrooms that offer ample opportunities to play.

References

Anastasiou, L., Kostaras, N., Kyritsis, E., & Kostaras, A. (2015). The construction of scientific knowledge at an early age: Two crucial factors. *Creative Education, 06*(02), 262–272. doi: 10.4236/ce.2015.62025

Barbu, O. C., Yaden, D. B., Levine-Donnerstein, D., & Marx, R. W. (2015). Assessing approaches to learning in school readiness: Comparing the Devereux Early Childhood Assessment to an early learning standards-based measure. *AERA Open*, *1*(3), 1–15. doi: 10.1177/2332858415593923

Bassok, D., Latham, S., & Rosem, A. (2016). Is kindergarten the new first grade? *AREA Open*, *4*(1), 1–31. doi: 10.1177/2332858415616358

Bierman, K. L., Torres, M. M., Domitrovich, C. E., Welsh, J. A., & Gest, S. D. (2009). Behavioral and cognitive readiness for school: Cross-domain associations for children attending Head Start. *Social Development*, *18*(2), 305–323. doi: 10.1111/j.1467-9507.2008.00490.x

Bjorklund, D. F., & Gardiner, A. K. (2011). Object play and tool use: Developmental and evolutionary perspectives. In D. Pellegrini (Ed.), *The Oxford handbook of the development of play (*pp. 153-171). Oxford, UK: Oxford University Press.

Bodrova, E., & Leong, D. J. (2005). High-quality preschool programs: What would Vygotsky say? *Early Education & Development*, *16*(4), 435–444. doi: 10.1207/s15566935eed1604_4

Bodrova, E., & Leong, D. J. (2007). *Tools of the mind.* Columbus, OH: Merrill.

Bodrova, E., & Leong, D. J. (2015). Vygotskian and post-Vygotskian views on children's play. In J. Johnson, S. Eberle, T. Hendricks, & D. Kuschner (Eds.), *The handbook of the study of play* (pp. 203–228). Lanham, MD: Roman & Littlefield.

Bodrova, E., & Leong, D. J. (2019). Making play smarter, stronger, and kinder: Lessons from tools of the mind. *American Journal of Play*, *12*(1), 37–53. Retrieved from https://www.journalofplay.org/

Bodrova, E. (2008). Make-believe play versus academic skills: A Vygotskian approach to today's dilemma of early childhood education. *European Early Childhood Education Research Journal*, *16*(3), 357–369. doi: 10.1080/13502930802291777

Bracken, B. A., & Crawford, E. (2010). Basic concepts in early childhood educational standards: A 50-state review. *Early Childhood Education Journal*, *37*(5), 421–430. doi: 10.1007/s10643-009-0363-7

Bredekamp, S. (2004). Play and school readiness. In *Children's play: The roots of Reading* (pp. 159–174). Washington, DC: Zero to Three.

Brown, C. P., Ku, D. H., & Barry, D. P. (2020). “Kindergarten isn’t fun anymore. Isn’t that so sad?”: Examining how kindergarten teachers in the US made sense of the changed kindergarten. *Teaching and Teacher Education*, *90*, 1–13. doi: 10.1016/j.tate.2020.103029

Bustamante, A. S., Greenfield, D. B., & Nayfeld, I. (2018). Early childhood science and engineering: Engaging platforms for fostering domain-general learning skills. *Education Sciences*, *8*(3), 144. doi: 10.3390/educsci8030144

Bustamante, A. S., White, L. J., & Greenfield, D. B. (2018). Approaches to learning and science education in Head Start: Examining bidirectionality. *Early Childhood Research Quarterly*, *44*, 34–42. doi: 10.1016/j.ecresq.2018.02.013

Carlsson-Paige, N. (2008). Reclaiming play: Helping children learn and thrive in school. *Exchange: The Early Childhood Leaders’ Magazine Since 1978*, *180*. Retrieved from https://www.childcareexchange.com

Carr, M., & Claxton, G. (2002). Tracking the development of learning dispositions. *Assessment in Education: Principles, Policy & Practice*, *9*(1), 9–37. doi: 10.1080/09695940220119148

Cerda, C. A., Im, M. H., & Hughes, J. N. (2014). Learning-related skills and academic achievement in academically at-risk first graders. *Journal of Applied Developmental Psychology*, *35*(5), 433–443. doi: 10.1016/j.appdev.2014.08.001

Chak, A. (2007). Teachers’ and parents’ conceptions of children’s curiosity and exploration. *International Journal of Early Years Education*, *15*(2), 141–159. doi: 10.1080/09669760701288690

Chalufour, I., & Worth, K. (2005). *Exploring Water with Young Children, Trainer’s Guide*. Corona, CA: Redleaf Press.

Chang, H., & Olson, S. L. (2016). Examining early behavioral persistence as a dynamic process: Correlates and consequences spanning ages 3–10 years. *Journal of Abnormal Child Psychology*, *44*(4), 799–810. doi: 10.1007/s10802-015-0063-2

Chen, J.-Q., & McNamee, G. D. (2011). Positive approaches to learning in the context of preschool classroom activities. *Early Childhood Education Journal*, *39*(1), 71–78. doi: 10.1007/s10643-010-0441-x

Claessens, A., Engel, M., & Curran, F. C. (2014). Academic content, student learning, and the persistence of preschool effects. *American Educational Research Journal*, *51*(2), 403–434. doi: 10.3102/0002831213513634

Creaser, B. (1990). *Pretend Play: A Natural Path to Learning.* Retrieved from Australian Early Childhood Association website: https://files.eric.ed.gov/fulltext/ED370690.pdf

Devi, A., Fleer, M., & Li, L. (2018). ‘We set up a small world’: Preschool teachers’ involvement in children’s imaginative play. *International Journal of Early Years Education*, *26*(3), 295–311. doi: 10.1080/09669760.2018.1452720

Duncan, R. M., & Tarulli, D. (2003). Play as the leading activity of the preschool period. *Early Education and Development*, *14*(3), 271–292. doi: 10.1207/s15566935eed1403_2

Elkonin, D. B. (2005). The psychology of play. *Journal of Russian and East European Psychology*, *43*(1), 12. doi: 10.1080/10610405.2005.11059245

Emfinger, K. (2009). Numerical conceptions reflected during multiage child-initiated pretend play. *Journal of Instructional Psychology*, *36*(4), 326–334. Retrieved from https://www.questia.com/library/p6137/journal-of-instructional-psychology

Eshach, H., & Fried, M. N. (2005). Should science be taught in early childhood? *Journal of Science Education and Technology*, *14*(3), 315–336. doi: 10.1007/s10956-005-7198-9

Fantuzzo, J., Bulotsky-Shearer, R., McDermott, P., McWayne, C., Frye, D., & Perlman, S. (2007). Investigation of dimensions of social-emotional classroom behavior and school readiness for low-income urban preschool children. *School Psychology Review*, *36*(1), 44–62. Retrieved from https://naspjournals.org/loi/spsr

Fantuzzo, J., Perry, M. A., & McDermott, P. (2004). Preschool approaches to learning and their relationship to other relevant classroom competencies for low-income children. *School Psychology Quarterly*, *19*(3), 212–230. doi: 10.1521/scpq.19.3.212.40276

Fleer, M. (2009). Understanding the dialectical relations between everyday concepts and scientific concepts within play-based programs. *Research in Science Education*, *39*(2), 281–306. doi: 10.1007/s11165-008-9085-x

Fleer, M. (2011a). ‘Conceptual play’: Foregrounding imagination and cognition during concept formation in early years education. *Contemporary Issues in Early Childhood*, *12*(3), 224–240. doi: 10.2304/ciec.2011.12.3.224

Fleer, M. (2011b). Kindergartens in cognitive times: Imagination as a dialectical relation between play and learning. *International Journal of Early Childhood*, *43*(3), 245–259. doi: 10.1007/s13158-011-0044-8

Fleer, M. (2018). Conceptual Playworlds: The role of imagination in play and learning. *Early Years*, 1–12. doi: 10.1080/09575146.2018.1549024

Foreman, G. (2006). Constructive play. In D. Fromberg & D. Bergen (Eds.), *Play from birth to twelve: Contexts, perspectives, and meanings.* (2nd ed., pp. 103–111). New York: Routledge.

Fox, E., & Riconscente, M. (2008). Metacognition and self-regulation in James, Piaget, and Vygotsky. *Educational Psychology Review*, *20*(4), 373–389. doi: 10.1007/s10648-008-9079-2

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. doi: 10.3102/00346543074001059

French, L. (2004). Science as the center of a coherent, integrated early childhood curriculum. *Early Childhood Research Quarterly, 19*(1), 138–149. doi: 10.1016/j.ecresq.2004.01.004

Ginsberg, H. P. (2006). Mathematical play and playful mathematics: A guild for early education. In D. Singer, K. Hirsh-Pasek, & R. Golinkoff (Eds.), *Play = Learning*: *How play motivates and enhances children's cognitive and social-emotional growth* (pp.145-168). Oxford, England: University Press Scholarship.

Ginsburg, H. P., Lee, J. S., & Boyd, J. S. (2008). Mathematics education for young children: What it is and how to promote it. *Social Policy Report, 12*(1), 3–24. Retrieved from https://eric.ed.gov/?id=ED521700

Gleave, J., & Cole-Hamiltion, I. (2012). *A world without play: A literature review*. Retrieved from Play England and BTHA website: https://www.eerg.com.au/images/PDF/A-world-without-play-literature-review-2012.pdf

Graue, M. E., Ryan, S., Nocera, A., Northey, K., & Wilinski, B. (2017). Pulling preK into a K-12 orbit: The evolution of preK in the age of standards. *Early Years*, *37*(1), 108–122. doi: 10.1080/09575146.2016.1220925

Hakkarainen, P. (2010). Cultural-historical methodology of the study of human development in transitions. *Cultural-Historical Psychology*, *6*(4), 75–82. Retrieved from https://psyjournals.ru/en/kip/2010/n4/Hakkarainen.shtml

Hamlin, M., & Wisneski, D. B. (2012). Supporting the scientific thinking and inquiry of toddlers and preschoolers through play. *YC Young Children*, *67*(3), 82. Retrieved from https://www.naeyc.org/resources/pubs/yc

Hao, Y., & Fleer, M. (2016). Pretend sign created during collective family play: A cultural-historical study of a child's scientific learning through everyday family play practices. *International Research in Early Childhood Education*, *7*(2), 38–58. Retrieved from https://eric.ed.gov/?id=EJ1138699

Hedges, H., & Cullen, J. (2012). Participatory learning theories: A framework for early childhood pedagogy. *Early Child Development and Care*, *182*(7), 921–940. doi: 10.1080/03004430.2011.597504

Holzman, L. (1995). Creating developmental learning environments: A Vygotskian practice. *School Psychology International*, *16*(2), 199–212. doi: 10.1177/0143034395162009

Karpov, Y. V. (2014). *Vygotsky for educators*. New York: Cambridge University Press.

Leont'ev, A. N. (1981). *Problems in the development of the mind*. Moscow, Russia: Progress.

Li-Grining, C. P., Votruba-Drzal, E., Maldonado-Carreno, C., & Haas, K. (2010). Children's early approaches to learning and academic trajectories through fifth grade. *Developmental Psychology*, *46*(5), 1062–1077. doi: 10.1037/a0020066

McDermott, P. A., Rikoon, S. H., & Fantuzzo, J. W. (2014). Tracing children's approaches to learning through Head Start, kindergarten, and first grade: Different pathways to different outcomes. *Journal of Educational Psychology*, *106*(1), 200–213. doi: http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0033547

McDermott, P. A., Rovine, M. J., Reyes, R. S., Chao, J. L., Scruggs, R., Buek, K., & Fantuzzo, J. W. (2018). Trajectories of early education learning behaviors among children at risk: A growth mixture modeling approach. *Psychology in the Schools*, *55*(10), 1205–1223. doi: 10.1002/pits.22145

Miller, E., & Almon, J. (2009). *Crisis in the kindergarten: Why children need to play in school*. Retrieved from Alliance for Childhood website: https://files.eric.ed.gov/fulltext/ED504839.pdf

National Research Council. (2000). *Inquiry and the National Science Education Standards: A guide for teaching and learning*. Washington, DC: National Academies Press.

National Research Council. (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Washington, DC: National Academies Press.

Nicolopoulou, A., Barbosa de Sa, A., Ilgaz, H., & Brockmeyer, C. (2009). Using the transformative power of play to educate hearts and minds: From Vygotsky to Vivian Paley and beyond. *Mind, Culture, and Activity*, *17*(1), 42–58. doi: 10.1080/00220272.2011.637182

Nilsson, M., Ferholt, B., & Lecusay, R. (2018). 'The playing-exploring child': Reconceptualizing the relationship between play and learning in early childhood education. *Contemporary Issues in Early Childhood*, *19*(3), 231–245. doi: 10.1177/1463949117710800

Oers, B., & Duijkers, D. (2013). Teaching in a play-based curriculum: Theory, practice and evidence of developmental education for young children. *Journal of Curriculum Studies, 45*(4), 511–534. doi: 10.1080/00220272.2011.637182

Paz-Albo Prieto, J., Cvencek, D., Herranz Llácer, C. V., Hervás Escobar, A., & Meltzoff, A. N. (2017). Preschoolers' mathematical play and colour preferences: A new window into the development of gendered beliefs about math. *Early Child Development and Care*, *187*(8), 1273–1283. doi: 10.1080/03004430.2017.1295234

Perry, B., Young-Loveridge, J., Dolckett, S., & Doig, B. (2008). The development of young children's mathematical understanding. *Research in Mathematics Education in Australasia, 2004 - 2007*, 17–40. Retrieved from http://dro.deakin.edu.au/view/DU:30017019

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2012). The implications of early attentional regulation for school success among low-income children. *Journal of Applied Developmental Psychology*, *33*(6), 311–319. doi: 10.1016/j.appdev.2012.07.005

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2015). Are approaches to learning in kindergarten associated with academic and social competence similarly? *Child & Youth Care Forum*, *44*(6), 757–776. doi: 10.1007/s10566-015-9307-0

Rogoff, B. (2003). *The cultural nature of human development*. Oxford, England: Oxford University Press.

Rudd, L. C., Lambert, M. C., Satterwhite, M., & Zaier, A. (2008). Mathematical language in early childhood settings: What really counts? *Early Childhood Education Journal*, *36*(1), 75–80. doi: 10.1007/s10643-008-0246-3

Sarama, J., & Clements, D. H. (2009). Building blocks and cognitive building blocks. *American Journal of Play*, *1*(3), 313–337. Retrieved from https://www.journalofplay.org/

Scharer, J. H. (2017). Supporting young children's learning in a dramatic play environment. *Journal of Childhood Studies*, *42*(3), 62. doi: 10.18357/jcs.v42i3.17895

Seo, K. H., & Ginsburg, H. P. (2004). What is developmentally appropriate in early childhood mathematics education? Lessons from new research. In D. Clements & J. Samara (Eds.), *Engaging young children in mathematics: Standards for early childhood mathematics education (*pp. 91-104). Mahwah, NJ: Lawrence Erlbaum Associates

Smirnova, E. O., & Gudareva, O. V. (2015). Play and intentionality among today's preschoolers. *Journal of Russian & East European Psychology*, *52*(4), 1–20. doi: 10.1080/10610405.2015.1184891

Solis, S. L., Curtis, K. N., & Hayes-Messinger, A. (2017). Children's exploration of physical phenomena during object play. *Journal of Research in Childhood Education*, *31*(1), 122–140. doi: 10.1080/02568543.2016.1244583

Stipek, D. (2006). No child left behind comes to preschool. *The Elementary School Journal*, *106*(5), 455–466. doi: 10.1086/505440

Stipek, D., Newton, S., & Chudgar, A. (2010). Learning-related behaviors and literacy achievement in elementary school-aged children. *Early Childhood Research Quarterly*, *25*(3), 385–395. doi: 10.1016/j.ecresq.2009.12.001

Stone, S. J. (2017). The essential role of play in school contexts for the well-being of children. *LEARNing Landscapes*, *10*(2), 305–318. doi: 10.36510/learnland.v10i2.817

Toub, T. S., Rajan, V., Golinkoff, R. M., & Hirsh-Pasek, K. (2016). Guided play: A solution to the play versus learning dichotomy. In D. C. Geary & D. B. Berch (Eds.), *Evolutionary Perspectives on Child Development and Education* (pp. 117–141). New York, NY: Springer

van Oers, B. (1994). Semiotic activity of young children in play: The construction and use of schematic representations. *European Early Childhood Education Research Journal*, *2*(1), 19–33. Retrieved from https://www-tandfonline-com.ezproxy.lib.ou.edu/toc/recr20/current

van Oers, B. (2010). Emergent mathematical thinking in the context of play. *Educational Studies in Mathematics*, *74*(1), 23–37. doi: 10.1007/s10649-009-9225-x

Vygotsky, L. S. (1967). Play and its role in the mental development of the child. *Soviet Psychology*, *5*(3), 6–18. doi: 10.2753/RPO1061-040505036

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (Revised ed. edition; M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1987). Thinking and speech. In R. W. Rieber & A. S. Carton (Eds.), & N. Minick (Trans.), *The collected works of LS Vygotsky: The fundamentals of defectology*: *Vol. 1 Problems of General Psychology*. New York: Plenum Press.

Vygotsky, L. S. (2004). Imagination and creativity in childhood. *Journal of Russian & East European Psychology*, *42*(1), 7–97. doi: 10.1080/10610405.2004.11059210

Wager, A. A. (2013). Practices that support mathematics learning in a play-based classroom. In L. D. English & J. T. Mulligan (Eds.), *Reconceptualizing early mathematics learning* (pp. 163–181). doi: 10.1007/978-94-007-6440-8_9

Weisberg, D. S., Hirsh-Pasek, K., & Golinkoff, R. M. (2013). Guided Play: Where Curricular Goals Meet a Playful Pedagogy. *Mind, Brain, and Education*, *7*(2), 104–112. doi: 10.1111/mbe.12015

Wolfe, C., Cummins, R., Myers, C., & Cedillos, E. (2006). Scientific inquiry and exploratory representational play. In Pronin & D. Bergen (Eds.), *Play from birth to twelve: Contexts, perspectives, and meanings* (3rd ed., pp. 199–206). New York: Routledge.

Worth, K. (2010). Science in early childhood classrooms: Content and process. *Early Childhood Research and Practice*, *12*(2), 17. Retrieved from https://ecrp.illinois.edu/beyond/index.html

Worthington, M., Dobber, M., & van Oers, B. (2019). The development of mathematical abstraction in the nursery. *Educational Studies in Mathematics*, *102*(1), 91–110. doi: 10.1007/s10649-019-09898-3

Worthington, M., & van Oers, B. (2016). Pretend play and the cultural foundations of mathematics. *European Early Childhood Education Research Journal*, *24*(1), 51–66. doi: 10.1080/1350293X.2015.1120520

MANUSCRIPT III

Profiles of Adaptive Magic:

Children's Approaches to Learning

This manuscript is prepared for submission to the peer-reviewed journal *Early Education and Development* and is the third of three manuscripts prepared for a journal-ready doctoral dissertation.

Abstract

Researchers are interested in the distinctive ways in which children successfully adapt to new school environments despite environmental influences, stress, or adversity. Children's Approaches to Learning (AtL) is a construct representing the normative, adaptive responses to classroom interactions and includes children's initiative, attention, task orientation, and persistence. While it has typically been studied using a composite of a teacher-rated scale, person-centered approaches may be able to account for heterogeneity in children's adaptive responses in a way that accounts for the myriad of ways children approach learning. This study used Latent Profile Analysis in a study of Head Start children (n=355) ranging in age from 28 to 59 months. Five different profiles of children emerged, including those who had low, medium, and high AtL as well as two unique profiles. While there were no significant differences among the profiles in terms of ethnicity, children in the two lowest profiles were more likely to be boys. Multilevel regression models were conducted to examine whether profile membership was associated with children's academic outcomes. Children in the profile with the highest AtL had significantly higher achievement across all academic measures. Implications for teachers are discussed and include ways in which teachers can promote children's AtL.

Keywords: Latent Profile Analysis, resilience, PreK, academic achievement

Profiles of Adaptive Magic: Children's Approaches to Learning

During their preK year, many children develop cognitive, social, and emotional skills that place them on a path towards positive teacher and peer relationships, affirmative motivation, and achievement in academics (Pratt, Swanson, van Huisstede, & Gaias, 2019). Along the way, children encounter new classroom expectations such as sitting still, listening to the teacher, getting along with others, and entering a group of children already at play (Campbell & von Stauffenberg, 2008). These expectations may be initially difficult for children unfamiliar with a school environment (Denham, Bassett, Mincic, et al., 2012). In fact, children exhibit a range of behaviors in response to the demands of a new environment (McWayne, Cheung, Wright, & Hahs-Vaughn, 2012). While many of these behaviors are adaptive, some are not and may ultimately interfere with a child's ability to engage in classroom learning activities (McWayne & Cheung, 2009). Thus, it is critical to understand the characteristics of adaptive children to support children's success (Fantuzzo, Perry, & McDermott, 2004; George & Greenfield, 2005).

Researchers are interested in the distinctive ways children successfully adapt, despite environmental influences, stress, or adversity (Cantor, Osher, Berg, Steyer, & Rose, 2019). This positive adaption, resilience, is defined as the "capacity of an individual to adapt successfully to challenges through multiple processes" (Masten & Cicchetti, 2016, p. 275). Resilience is especially important during times of transition when internal and external factors present new opportunities for adaptation (Ungar, Ghazinour, & Richter, 2013). Masten (2001) argues that positive adaptions are not rare, but ordinary, resulting from the normative processes of basic human systems responding to variations in the environment. As children's responses to adversities represent many diverse pathways of resilience, more research is needed to better understand children's individual responses to the environment.

Approaches to Learning (AtL) is a construct that represents a child's normative, adaptive response (DiPerna, Volpe, & Elliott, 2002). It is a constellation of learning-related skills and behaviors that connect children to learning opportunities in the classroom (Reid et al., 2014). Following directions, persevering with challenging tasks, adapting problem-solving strategies, working independently, and cooperating with classmates are ways in which AtL facilitates learning (Blair, 2002; Razza et al., 2015). It also represents flexible strategies that potentially mitigate the effects of maladaptive behavior on academic readiness (Domínguez, Vitiello, Maier, & Greenfield, 2010; McWayne & Cheung, 2009).

Links between children's patterns of positive and negative adjustment and academic outcomes exist as early as preschool, giving rise to a need to understand patterns of adaptations within the classroom context (Bulotsky-Shearer, Dominguez, & Bell, 2012; Fantuzzo, Perry & McDermott, 2004). While previous research using variable centered approaches has established the link between AtL and academic achievement, it has not been able to account for the multiple contexts or varied ways in which children approach learning tasks. Rather than examining variation in the levels of children's AtL, as variable centered approaches do, person-centered approaches may be able to account for the heterogeneity in children's adaptive responses and reveal profiles of resilience (Abenavoli et al., 2017). To date, there have not been any studies examining children's AtL using person-centered approaches. The goal of this study is to use Latent Profile Analysis (LPA) to examine the patterns of AtL within a sample of preschool children and to investigate how these profiles are associated with children's academic outcomes.

Review of Literature

Approaches to Learning

AtL is a multidimensional construct developing rapidly between pre-k and kindergarten and then stabilizing by the end of elementary school (Bulotsky-Shearer, Fernandez, Dominguez, & Rouse, 2011; McDermott, Rikoon, & Fantuzzo, 2014). It is generally described as a broad set of skills that reflect children's engagement in classroom interactions and activities (Hyson, 2008; McDermott, Leigh, & Perry, 2002; Stipek et al., 2010). Current research on ATL includes a wide assortment of characteristics that vary from study to study (Fantuzzo et al., 2004; McDermott et al., 2014). For example, Kagan, Moore, and Bredekamp (1995) described AtL as a set of learning dispositions that "include variances that affect how children attitudinally address the learning process" (p. 23). However, Barbu, Yaden, Levine-Donnerstein, and Marx (2015) include attention, cooperation, having friends, managing frustration, and following the rules. A review of the different behaviors classified as AtL demonstrates considerable variability across the cognitive, social, emotional, and self-regulation domains (see Table 1) with little consistency evident in past studies. The most common elements of AtL include attention, cooperation, trying new things, persistence, and following the rules.

AtL supports children actively participating in learning situations with teachers and peers and thus helps maximize children's exposure to classroom instruction (Sasser et al., 2015). It has been associated with achievement in math, reading, science, and school readiness (Bustamante et al., 2018; Fantuzzo et al., 2004; McClelland et al., 2006; Stipek et al., 2010). Growth in AtL helps support growth in academic achievement, beyond the effects of children's IQ, previous literacy or math achievement, maternal educational level, or executive function (Cerda et al., 2014; Stipek et al., 2010; Sung & Wickrama, 2018).

Table 1

Approaches to Learning Constructs Across Studies

Study	Domain Characteristics																	
	Cognitive							Social					Emotional		Self-Control/Behavior			
	Focus Attention/ Concentrates	Attention to Detail	Stays on Task	Works Independently	Thinks and Plans	tries new things	Persists	Considers others' feelings	Has Friends	Cooperates	Plays with Others	Asks for Help	Manages Frustration	Refrains from blurting out	Follows Rules	Pays Attention	Manages Transitions	Takes care of materials
Barbu et al. (2015)	X					x			x	x		x	x		x			
Brock et al. (2009)	X	x		x			x							x	x	x		
Cerda et al. (2014)	X		x	x	x			x		x				x				
George & Greenfield (2005)	X		x							x	x	x					x	
McDermott et al. (2014)	X					x	x			x		x	x			x		
Nesbitt et al. (2015)	X									x	x				x			x
Li-Grinning et al. (2010)	X			x		x	x						x		x			
Sasser et al. (2015)	X	x				x	x			x					x	x		

Much of the research on the relationship between AtL and academic outcomes suggests it may be particularly beneficial when children are younger (Li-Grining et al., 2010; McClelland et al., 2006). PreK or kindergarten AtL is often predictive of academic achievement years later and may support children's positive adaptation to the new learning environment (Fitzpatrick & Pagani, 2013). Alternatively, children with poor AtL at kindergarten demonstrate significantly lower reading and math achievement by 6th grade, although differences can be detected by 2nd grade (McClelland et al., 2006). As a protective factor, AtL may be most beneficial when children have lower academic skills at school entry (Li-Grinning et al., 2010). Children with better AtL experience greater rates of academic growth, and the differences increase as children progress through elementary school. Similarly, Razza et al. (2015) found that AtL was most beneficial when children had lower math and reading skills; children with lower academic achievement but higher AtL at age 5 saw gains in academic achievement by age 9.

While research has been able to connect AtL with children's academic outcomes, many of these studies view AtL as a latent or global construct, without identifying any specific skills from the social, cognitive, and emotional domains (Cerda et al., 2014). While researchers agree AtL is essential, it is unclear exactly what skills constitute this umbrella construct (Domínguez, Vitiello, Fuccillo, Greenfield, & Bulotsky-Shearer, 2011). More research is needed that can capture children's AtL in different contexts or across different informants (Booren, Downer, & Vitiello, 2012; Chen, Masur, & McNamee, 2011). Heterogeneity and variability exist in how children navigate their learning environment (Bierman et al., 2009). Thus, research is needed, which examines the range of children's adaptive responses (Abenavoli et al., 2017).

Associations with Other Constructs

Despite its centrality as an educational construct, AtL has been plagued by definitional issues that often blur the distinctions between similar constructs like self-regulation, executive function, and social development (Beisly, 2020). While McDermott et al. (2018) point out AtL is conceptually rooted in social, cognitive, and emotional development, it remains distinct in that it represents the mechanisms by which children go about learning. Nevertheless, past research has confounded the concept of AtL, as AtL measures have been used to measure executive function (Hooper et al., 2010), and measures of social development have been used to measure AtL (George & Greenfield, 2005). Thus, more research is needed demonstrating how AtL is distinct from constructs like executive function and social development. Finally, some researchers have explored the construct of negative AtL as a maladaptive response to the learning environment (Fantuzzo et al., 2007). As such, it may be essential to consider children's behavior along a continuum, rather than as separate components of adjustment (Elliott, 2019).

Executive function. Executive function (EF) is primarily a cognitive skill that includes the subdomains of working memory, cognitive flexibility or attention shifting, and inhibitory control (Blair, 2002). AtL shares common terminology with EF, and the two are sometimes used interchangeably, especially when the construct is measured via attention or attention control (Barbu et al., 2015; Hooper et al., 2010). As part of executive function, attention shifting includes the ability to shift between two or more tasks or to move from one activity to the next, while in ATL, attention refers to a child's ability to focus on tasks, resist distractions, and persist (McWayne, Fantuzzo, & McDermott, 2004). Attention, as part of ATL, refers to more proximal processes of observable classroom-based behavior. In contrast, attention as part of EF or effortful control represents more distal or behind-the-scenes cognitive competencies (Barbu et al., 2015). EF typically refers to cognitively oriented tasks assessed in emotionally neutral contexts, while

children may utilize AtL in social situations (Jones, Bailey, Barnes, & Partee, 2016). Conceptually, EF represents neurological brain structures housed in the prefrontal cortex, while ATL represents more behaviorally based (and thus malleable) manifestations of behaviors related to EF (Blair, 2002). Finally, EF is often measured through direct assessment, while ATL is measured via teacher report.

Social development. Social development includes prosocial behaviors such as sharing, helping others, and expressing empathy (Graziano & Hart, 2016). Social development and AtL both rely on positive, cooperative relationships with others (Razza et al., 2015). However, AtL helps children participate in learning tasks, while social development supports children's overall relationships with peers that extend beyond the classroom (Cerda et al., 2014).

Social competence and AtL are often represented in the research as separate but interrelated constructs. For example, Bierman et al. (2009) found that children who had a combined profile of aggressive behavior (poor AtL) and prosocial deficits (social skills) showed higher achievement than did children who showed prosocial deficits alone. Those with prosocial deficits were learning less because of their disengagement with peers and passivity in the classroom. A study by Arnold, Kupersmidt, Voegler-Lee, and Marshall (2012) explored the mediational relationship of both social skills and AtL, finding prosocial behavior demonstrated a small negative relationship with math growth when AtL was also included in the model. Arnold et al. posit that AtL and social skills may share a significant amount of common variance that may be masked in previous studies that do not simultaneously include ATL and measures of social competence.

Problem Behaviors. As an adaptive response, AtL highlights how a child navigates a learning environment (Ponitz, McClelland, Matthews, & Morrison, 2009). However, some children's strategies include behaviors that escalate conflict and disrupt learning in the classroom (Denham, Bassett, Way, et al., 2012; McClelland et al., 2006). Referred to in the literature as negative approaches to learning, these mal-adaptive behaviors limit children's interactions with teachers or peers and do not promote learning (Chen & McNamee, 2011; Hyson, 2008; Montroy, Bowles, Skibbe, & Foster, 2014). Negative AtL includes a range of behaviors, from physical aggression and inattention, to behavior that is misaligned with the expectations of the setting, e.g., the child blurts out when the expectation is to raise hands (Bulotsky-Shearer & Fantuzzo, 2011). Problem behaviors appear to interfere not only with classroom learning processes but with the child's own ability to engage in learning (Montroy et al., 2014). Children with negative AtL may be easily distracted, give up easily, or be more likely to engage in interactions that disturb the learning environment.

A modest number of studies have examined the relationship between children's problem behavior and approaches to learning as two distinct constructs. Children's behavior problems or aggressive behavior has been associated with lower AtL (Domínguez et al., 2010; Fantuzzo, Bulotsky-Shearer, Fusco, & McWayne, 2005), especially when children are in structured learning environments, like whole group learning (Bulotsky-Shearer & Fantuzzo, 2011). AtL may represent a positive adaptation, buffering against problem behaviors and mediating the association between academic achievement and problem behavior (McWayne & Cheung, 2009). AtL may help harness children's interest in learning activities, despite frustration or inattentive behaviors (Dobbs, Doctoroff, Fisher, & Arnold, 2006).

As demonstrated above, previous research has been limited in the definitional clarity surrounding AtL. While AtL is conceptually distinct from executive function, social development, and problem behaviors, the empirical research to date has not clearly differentiated these constructs. Many previous studies examine AtL as a composite or global construct, without accounting for how individual children may possess different combinations of social, emotional, and cognitive competencies that help them adjust to classroom environments and engage in learning. Strengths in one domain may counteract limitations in another, as children with early behavior problems may be able to achieve positive academic outcomes with increased AtL (Downer & Pianta, 2006). However, our understanding of this complex relationship is limited by current variable centered approaches.

Person-Centered Approaches

Latent profile analysis (LPA) is a mixture modeling technique used when researchers seek to identify distinct patterns among multiple variables (Asparouhov & Muthen, 2014). As a person-centered approach, it has numerous advantages over more traditional variable-centered approaches in identifying the dynamics of emerging subgroups and capture heterogeneity in behavior (Howard & Hoffman, 2018; Racz, O'Brennan, Bradshaw, & Leaf, 2016). LPA allows for the classification of an underlying latent categorical variable that represents distinct profiles of the construct under study (Sabol & Pianta, 2017).

Person-centered approaches can be especially helpful in teasing apart characteristics that may have been overlapping or conflated in previous studies. For example, Racz et al. (2016) found three distinct profiles, well-adapted, concentration problems, and children at risk. The discovery of the concentration problems subgroup was unique in distinguishing children with attention problems from those with disruptive behavior problems. This profile could reflect

children who will develop attention problems or children who have difficulty adjusting to the more academic demands of kindergarten.

Another benefit of LPA is that it can detect small subgroups of children who have mixed patterns of behaviors (Litkowski, Finders, Borriello, Purpura, & Schmitt, 2020). For example, Abenavoli et al. (2017) measured school readiness using various academic and social-emotional skills, finding two subgroups with mixed patterns of strengths and weaknesses. One group, 'competent aggressive,' had higher levels of aggressive behavior, lower social skills, and strong academic abilities. These children had strengths in other domains that served to compensate for their lack of social skills to lead to academic outcomes. 'Academically disengaged' children were not aggressive but exhibited low social and academic skills. The risk for disengaged children is that because they are not a behavior problem, they may continue to fall behind. Other studies have found patterns of discordant performance among children's academic achievement and externalizing behavior (Elliot, 2019; Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006).

Multiple studies have used LPA to study umbrella constructs like school readiness, self-control, and emotion regulation (Denham et al., 2012; Hair et al., 2006; Vaughn et al., 2009). These studies have shown that children's positive social/emotional behavior tends to co-occur with other school readiness variables (Collie et al., 2019; Konold & Pianta, 2005;). A more fine-grained analysis of children's individual experiences may be able to capture how children's specific social and emotional skills help them to navigate each type of preschool learning activity or social interaction (Kontos & Keyes, 1999). It may also reveal patterns of AtL that are reflected in different researchers' operationalizations of AtL.

The current understanding of how AtL is configured within individual children is limited to variable-centered approaches (Elliott, 2019). Previous research has provided evidence that

distinct components of AtL are related, but it is not known how they co-occur among groups of children. Given the overlap in components of AtL across studies, LPA may be able to distinguish profiles of children with varying combinations of cognitive, social, and emotional subcomponents. While these variables tend to be highly interrelated and connected, profile analysis can account for the noise generated by this overlap in the creation of heterogeneous profiles of children. This analysis can also potentially identify different subgroups of students along a continuum of positive and negative learning approaches (Collie, Martin, Nassar, & Roberts, 2019).

The Current Study

AtL has been previously researched using variable centered approaches that explore how children adapt to their learning environment. These approaches typically view AtL as a global construct that supports children's positive interactions with teachers and peers (Kagan et al., 1995; McClelland & Morrison, 2003). However, insufficient research exists on exactly how to measure this construct in a way that accurately distinguishes it from other similar constructs and captures children's behavior across different contexts (Barbu, Levine-Donnerstein, Marx, & Yaden Jr, 2013; Ponitz, McClelland, et al., 2009). Moreover, past research has relied on teacher reports of children's behavior, without accounting for the various contexts in which children's behavior may manifest.

LPA offers one way to overcome some of the limitations of previous research. Profile analysis examines non-linear patterns of behavior and can provide insight into how the variables of AtL are inter-related, especially for individual children. In this way, we can understand qualitative differences in children's adjustment to a school environment and how these distinct patterns are associated with children's academic achievement. In addition, LPA using multiple

informants represents a critical contribution to previous research. Importantly, it can shed light on discordant patterns of adjustment, indicating unique profiles of children's strengths.

Ratings of AtL from multiple informants were utilized to examine profiles of AtL. Based on previous research and theory demonstrating variation in children's AtL, I expected to find groups that represented high, low, and mixed patterns of AtL. Additionally, as existing studies have demonstrated patterns of discordance when examining children's social/emotional behavior, behavior problems, and academic achievement, I hypothesized that I would uncover at least one profile of AtL that included problem behaviors. Given that AtL is positively associated with children's academic achievement, this study explored the relationship between children's profile membership and various academic assessments, with the hypothesis that profile membership would differentially be associated with academic achievement.

This study explored how children's combinations of characteristics contribute to the expression of AtL in the classroom. Further understanding of how these subgroups differ in their academic competencies can help researchers understand the relationship between early AtL and children's competence. The research questions for this study include

1) What are the distinct profiles of AtL?
2) What are the demographic characteristics of children associated with these profiles? How are these profiles related to children's executive function and social development?
3) How are these profiles predictive of children's academic outcomes, controlling for child characteristics?

Methods

Data Source

This study utilized data from a larger study exploring child, family, and classroom characteristics of a Head Start program, the Preschool Child Assessment Survey (PCAS) that used a multi-stage sampling approach. First, classrooms were randomly chosen from the list of possible Head Start classrooms, with each classroom having an equal probability of selection. Then, six children were selected from each classroom, stratified by gender and home language, to match program enrollment.

Table 2 provides the PCAS timeline. Children in this sample were assessed at two time points, the fall and spring of their Head Start year. Classroom observations were conducted in the winter. Multiple methods were used to collect an array of information about children and families, including direct child assessments, classroom observations, and teacher reports. Additional demographic information for the children was accessed through program administrative records.

Table 2

Assessments by Data Collection Timepoint

Fall	Winter	Spring
DECA	inCLASS	DECA
Leiter		Leiter
Woodcock-Johnson		Woodcock-Johnson
BRACKEN		BRACKEN
Task-Based EF measures		Task-Based EF measures

Participants

Participants included children (n = 355) who were enrolled in 61 classrooms from one Head Start program in a medium-sized U.S. city. Given that the children qualify for Head Start, most of the sample were low income. Recruitment of the identified children occurred when research assistants approached the child's parent or guardian during drop-off and pick-up to

discuss the study and secure informed consent. Each child's assent to participate was monitored during the assessments by the trained assessors; children who became upset or refused to answer questions were returned to their classrooms. Two additional attempts, on different days, were made to assess children who had previously refused to participate.

Participants ranged in age from 28 to 59 months (*M*= 44.54, *SD = 8.63)*. Most participants were Hispanic (31%), Black/African American (21%), white (19%), or mixed/other (29%). There were more boys than girls in the sample (female=38%). Most participants' (59%) home language was English, while 35% of participants' home language was Spanish.

Measures

Several measures representing different reporters were used. Children's AtL was measured via teacher report, assessor report, and a classroom-based observation. Three different measures of children's EF were conducted via direct assessment. Social development, including children's positive interactions with peers, was measured by classroom observation, while children's problem behaviors were measured by teacher report. Finally, this study also included direct assessments of children's vocabulary, math, and overall school readiness. All measures discussed below are organized by the construct they purport to assess—AtL, EF, social development, and academic outcomes.

Approaches to Learning. Approaches to learning was assessed using three measures, the Individual Classroom Assessment Scoring System, the Devereaux Early Child Assessment, and the Leiter-R.

Individual Classroom Assessment Scoring System. The Individual Classroom Assessment Scoring System (inCLASS) is a child-focused observational assessment of children's positive and active engagement with teachers, peers, and tasks in preschool (Downer,

Booren, Lima, Luckner, & Pianta, 2010). During an observation cycle, the target child was observed for ten minutes and then rated along ten dimensions on a seven-point scale from 1 (low) to 7 (high) (Yoder, Williford, & Vitiello, 2019). Ratings incorporate both the quality and the frequency of specified behaviors. Each child was observed multiple times (sweeps) throughout the day, and these sweeps were averaged to create a dimension score.

The inCLASS includes ten dimensions across three domains (teacher interactions, peer interactions, and task orientation). In this study, AtL was measured via two dimensions (engagement and self-reliance) of task orientation, a domain describing children's use of on-task, self-directed behavior to manage the academic demands of the classroom (Downer, Booren, Hamre, Pianta & Williford, 2012). Engagement with tasks is a measure of the degree to which a child is consistently and actively involved in classroom tasks, including sustained attention, focus, and interest. A child rated high in engagement is actively engaged and enthusiastic about activities. Self-reliance measures the degree to which a child takes learning into their own hands by actively seeking out learning opportunities and making use of classroom resources. A child high in self-reliance demonstrates initiative, can link new concepts to previous experiences, persists through struggles, and needs limited guidance.

Several studies have researched the psychometric properties of the inCLASS. For example, Downer et al. (2010) found support for concurrent validity when the positive engagement with teachers inCLASS dimension was positively related to ratings of teacher-child closeness and child assertiveness. It has also shown construct and criterion validity specific to both positive and negative peer engagement, with studies identifying mild or moderate associations between the inCLASS peer dimensions and teacher-rated social skills on measures such as the Teacher-Child Rating Scale (Downer et al., 2010). The inCLASS has demonstrated

discriminant validity, as the teacher interaction domain was primarily unrelated to any task-peer and conflict focused rating scales (Williford et al., 2013). It has been able to maintain measurement properties across demographic groups including poverty status, ethnicity, and gender (Bohlmann et al., 2019). It has also been associated with measures of school readiness and self-regulation, indicating that the inCLASS can capture behaviors relevant to the learning process (Sabol et al., 2018).

Devereux Early Childhood Assessment, Preschool 2nd edition. The Devereux Early Childhood Assessment (DECA-2P) is a standardized, norm-referenced rating scale used to assess the behavior and functioning of children aged 2 to 5 (LeBuffe & Shapiro, 2004). The DECA is designed to identify children's strengths in social, emotional, and behavioral functioning and includes two subscales, total protective factors (27 items) and behavioral concerns (10 items) (Crane, Mincic, & Winsler, 2011). Caregivers rate children on a 5-point scale according to how often (never, rarely, occasionally, frequently, very frequently) behavior has been observed within the last four months, such that higher scores indicate more protective factors. Raw scores are typically converted to T-scores for analysis with a mean of 50 and a standard deviation of 10.

The DECA has demonstrated acceptable psychometric properties. Lien and Carlson (2009) provided evidence that the internal consistency and standard error of measurement values on the DECA for a Head Start sample that closely mirrored those of the standardization sample, indicating that the measure was reliable with Head Start populations. Similarly, Crane et al. (2011) demonstrated that the measure had internal consistency within a low-income and ethnically diverse sample and that there were no differences in internal consistency between the Spanish and English versions of the DECA.

Factor analysis across multiple studies (Crane et al., 2011; LeBuffe & Shapiro, 2004) has shown the protective items load onto three factors. These include initiative, the child's ability to use independent thought and action to meet his/her needs; self-regulation, the child's ability to experience a range of feelings and express them; and attachment, a measure of the mutual, strong and long-lasting relationship between the child and a significant adult. For this study, only selected items were utilized because the DECA is intended to be a measure of protective factors and not AtL expressly. Items were selected that correspond to previous researchers' operationalizations of AtL that focus on observable classroom behaviors (see Table 1). For the attachment subscale, this included two questions: asks an adult to read to him/her and looks forward to activities. For self-regulation, four items were kept: plays with others, handles frustration, is patient, and accepts another choice if the first choice is not available. The item-level responses within the subscale were summed and then divided by the total number of responses to create a subscale score (e.g., two for the attachment subscale). The two subscales were maintained as distinct components; however, the labels were changed to reflect classroom-based behavior. The attachment subscale was renamed adaptive behavior, and the self-regulation subscale was renamed emotion management.

Leiter-R Examiner Rating Scale. The Leiter-R Examiner Rating Scale (Leiter-R) is a behavior rating scale that is completed by an assessor after a testing session and is designed to provide a snapshot of the child's test-taking behavior or socio-emotional factors (Roid & Miller, 1997). The assessor rates children's behavior from 0 (rarely) to 3 (always), with higher scores indicating better behavior. Children are rated according to eight subscales: attention, organization, activity level, sociability, energy/feelings, regulation and mood regulation, anxiety, and sensitivity reactivity. For this study, the attention scale was used, which converts the

composite of the subscale scores to a scaled score with a possible range from 1-19. The 8 items in the attention subscale include whether the child pays attention, stays on tasks, and sustains concentration. Attention was selected in particular because of its importance to the construct of AtL. The testing manual describes the psychometric properties of the standardization sample, including reliability coefficients for the subscales, which ranged from .71 to .96 across age groups, with only five coefficients falling below .80 (Farmer, 2013).

Task-based executive function. Executive function was assessed via three tasks, Pencil Tal, Digit Span, and the Head Shoulders Knees and Toes task.

Pencil Tap. As a measure of inhibitory control, the Pencil Tap is a simple, yet objective assessment of the child's ability to suppress the urge to copy the assessor (Blair & Razza, 2007). Both the child and the assessor have a pencil; if the assessor taps twice, the child is instructed to tap once and vice versa. Children are given three practice trials, and, upon succeeding, are administered 16 additional trials. Each correct trial was scored a one; thus, scores range from 0 to 16. This measure is a widely used measure of EF, particularly for younger children (Fuhs, Farran, & Nesbitt, 2015; Smith-Donald, Raver, Hayes, & Richardson, 2007; Weiland, Barata, & Yoshikawa, 2014). Test-retest reliability for the pencil tap has been demonstrated with 4-year-olds at r = .80 (Lipsey et al., 2017).

Digit Span. The Digit Span task is an assessment of children's working memory (Gathercole & Pickering, 2000). In this task, children are told a string of numbers and are asked to repeat the numbers back to the assessor in the correct order. Across trials, the number strings get increasingly longer. Similar to the Pencil Tap, children are given two practice items, and then trials begin with the first 2-digit number sequence. The trials stop when the child incorrectly repeats two different sequences of the same length. Children receive one point for each correct

answer, resulting in a range of possible scores from 0-11. The Digit Span has been utilized in several studies with young children and represents a valid measure of working memory (Bull, Espy, & Senn, 2004; Mahy & Moses, 2011).

Head Toes Knees Shoulders Task. Head Toes Knees Shoulders task (HTKS) is a measure of children's overall behavioral control, including their cognitive flexibility and working memory (McClelland et al., 2014). The task is appropriate for children from 4 to 8 years old and relies on verbal instructions from the assessor. During the initial phase of the task, children are directed to respond naturally to the directions, i.e., touch your toes would indicate touch your toes. During the next phase, children are instructed to do the opposite—if they are instructed to touch their heads, then they touch their toes. During the final phase, the pairings are switched again. This time, the head goes with the knees. Children only move to the next phase after correctly responding in the previous phase, until they have reached 30 trials. Children receive a score of 2 per trial if they answer correctly and a 1 if they answer incorrectly at first but then self-correct; thus, the range of possible scores is from 0-60. The HTKS has been used as a measure of executive function in several studies of young children (McClelland & Cameron, 2012; Ponitz, McClelland, et al., 2009; Wanless, McClelland, Tominey, & Acock, 2011). Additionally, the task demonstrates strong interrater reliability and construct and predictive validity (Ponitz et al., 2009).

Social development. Two subscales from two previously described measures were used to capture children's social development. To measure children's problem behaviors, the behavior concerns subscale of the DECA was used. This includes 10 teacher-rated questions on the frequency of behavior such as hurting others with actions or words, has a temper tantrum, seems uninterested in adults/children, and has difficulty concentrating. The T-score was used for analysis, which converts the raw scores to a t-score with a mean of 50 and a standard deviation of 10.

The peer sociability dimension of the peer interactions domain of the inCLASS was used to measure children's social development. Peer interaction measures children's social interactions with peers. For this study, the peer sociability dimension was used, which measures children's positive emotions and behaviors with other children that receive positive reactions. This dimension captures children's cooperation, shared positive affect, and proximity seeking. A child rated high in peer sociability spends a lot of time with peers, matches the affect of other children, shares materials, and is warmly received and sought out for play by peers. Both behavior problems and peer sociability were selected for this study to validate the profiles because these components of children's behavior seemed distinct from AtL.

Academic outcomes. Four measures of children's academic achievement were used in this study, the Woodcock Johnson Applied Problems, the Expressive One-Word Vocabulary Test, the Woodcock Johnson Letter Identification, and the Bracken School Readiness assessment

Woodcock-Johnson Applied Problems III. The Woodcock-Johnson Applied Problems III is a nationally normed assessment of math (Woodcock, Mcgrew, & Mather, 2001). The applied problems portion of the assessment was used, which measures children's ability to solve oral problems, including counting pictured objects and simple story problems (e.g., "Show me

two fingers," "How many ducks are in the water?"). In this assessment, children answer questions by looking at pictures presented using a testing flipbook, proceeding through the items until they have reached the ceiling pre-established by the test authors. In the current study, the total standardized score, which accounts for the child's age, was used. Standard scores have a mean of 100 and a standard deviation of 15. This measure has been used in numerous studies to measure math achievement and has an average Cronbach's α for preschool-age children of .91 (Rhoades, Warren, Domitrovich, & Greenberg, 2011). The subtest's internal reliability is 0.92 for 3-year-old children and 0.94 for 4-year-old children for the WJ III (Woodcock et al., 2001)

Woodcock-Johnson Letter Word Identification. Part of the Woodcock-Johnson Psycho-Educational Battery Tests of Achievement, this particular assessment measures children's ability to identify letters and words (Woodcock, McGrew, & Mather, 2001). Children were shown a flipbook containing various letters and were asked to identify them until they eached a pre-determined ceiling. Previous research has demonstrated that the instrument has a test-retest reliability of .96 for a less than 1-year interval and .91 for a 1- to 2-year interval, and a median split-half reliability of .98 for children four to seven years old or children ages two to seven (Woodcock et al., 2001).

Expressive One-Word Picture Vocabulary Test. The Expressive One-Word Vocabulary (EOWPVT) test is a nationally normed, individually administered assessment of children's expressive vocabulary (Gardner, 1990; Martin & Brownell, 2001). This assessment measures the expressive vocabulary of children from both English-and Spanish-speaking households, as children can answer in either language. In this assessment, children are shown a set of pictures and are directed to say the word for each picture, e.g., identifying a pillow, hair, or a cloud, proceeding through the items until they have reached the ceiling pre-established by the test

authors. The EOWPVT Spanish version has been shown to produce similar results compared to the English version (Hoff & Ribot, 2017). In addition, the EOWPVT has demonstrated strong evidence of reliability and validity (Jenkins, 2005; Martin & Brownell, 2011). In the current study, the total standardized score was used.

Bracken School Readiness Assessment. The Bracken School Readiness Assessment consists of 88 items designed to measure children's overall school readiness (Bracken, 2007; Panter & Bracken, 2009). Assessors use a flipbook with visual supports; items include colors, letters, numbers, sizes, comparisons, and shapes. The assessment takes approximately 15 minutes to administer. Items are scored as correct (score of 1) or incorrect (0) and summed within a subtest to provide a raw score, which then is converted to a scaled score based on the child's age with a mean of 100 and a standard deviation of 15. The Bracken has been normed on a sample of children ranging from 2 to 8 years old (Bracken, 2007). It has also been used as a measure of school readiness in several studies with young children (Caughy & Owen, 2015; Graziano, Slavec, Hart, Garcia, & Pelham, 2014).

Procedures

All assessments were administered by trained assessors. Prior to data collection, assessors were provided with extensive training on each of the child assessment measures (Woodcock-Johnson, Bracken, task-based EF measures). During training, assessors reviewed manuals and conducted practice assessments. Assessors met reliability criteria established by the research team or as recommended by the authors of various measures and were then certified by the PCAS training coordinator prior to administering assessments to study children. Similarly, for the classroom observations, assessors attended two days of training on the inCLASS, where they watched videos, practiced coding using the inCLASS manual, and discussed results. Assessors

then independently coded video clips and had to score within 1 point of a master coder on 80% of items to be deemed reliable and ready for data collection.

As noted in Table 2, child assessments were conducted during the fall and spring. Children were assessed one-on-one with a trained assessor in an isolated area of the Head Start classroom or hallway. Child assessments were conducted over two mornings, with the task-based EF measures conducted on one day and the academic assessments conducted on the following day, with each assessment period lasting approximately 30 minutes. Immediately following the second day of assessment, the assessor completed the Leiter-R assessment. While assessors were on-site conducting the child assessments, they collected the teacher-reported measures.

For the classroom-based observations, a research team member was assigned to a participating classroom to conduct observations, which lasted approximately four hours. Each child in the study was observed for approximately ten minutes, following by five minutes of scoring. Observations continued throughout the day until naptime to obtain as many cycles per study child as possible (mean cycles = 3.67).

Data Analysis

Preliminary analyses. Using SPSS 25, descriptive analyses were conducted to provide means and standard errors for study variables and to examine the distributions for normality. Although the items in the DECA were rated on a Likert-type scale (ranging from 0-4), many of item-level responses violated normality, with high skewness and kurtosis values. Items in these measures were converted to categorical variables. To do this, the five-point scales were recoded to 3-point scales to indicate low (0-1), medium (2), and high frequency (3-4).

Primary analyses. For the first two research questions, a series of LPA models were estimated in *Mplus* based on the items included in the AtL measures. Full information maximum likelihood was used to handle missing data (Muthén & Muthén, 1998). By utilizing maximum likelihood testing, LPA incorporates individuals with data from at least one indicator variable (i.e., initiative, attention). Therefore, data from the full sample was used to estimate the latent profiles. All continuous variables were standardized with z scores before conducting analyses to facilitate model interpretation. The series of LPA models was estimated, beginning with a 1-class solution and adding an additional class in each successive model (Masyn, 2013). Variable means were free to vary across profiles, and variants were set to be equal across profiles for estimation purposes (see Appendix A for a complete description of the methods for primary analysis).

Multiple fit statistics were used to determine the number of profiles within the model. The Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and the SABIC (Sample Adjusted BIC) were used as measures of relative fit (West, Taylor, Wu, & others, 2012). Entropy was also used, with values of .80 or higher, providing evidence that profile classification of individuals occurs with minimal uncertainty (Celeux & Soromenho, 1996). Another measure of fit is the smallest group size, with groups numbering under 5% of the total pool of subjects considered a byproduct of the estimation produced (Roesch, Villodas, &

Villodas, 2010). Two other measures of fit used were the Lo, Mendell, and Rubin (LMR) test, and the bootstrap likelihood ratio test, BLRT (Ferguson, Moore, & Hull, 2019). Both measures provide information about model parsimony, with a significant result indicating that the additional profile improves model fit. The standard procedure is to accept the model with the largest number of classes, smallest relative fit values, and a significant LMR/BLRT in conjunction with the intelligibility of the profiles (Nylund, Asparouhov, & Muthén, 2007).

After a model has been selected, the second step in the LPA is to assign participants to classes based on posterior class membership probabilities (Asparouhov & Muthén, 2014). Group assignment is then saved to the data file, which allows for an examination of the relationship between profile membership and auxiliary variables (Tupyrn, Chaplin, Cook, & Martelli, 2015). Multinomial logistic regression was used, where one latent profile served as a reference group to identify the extent to which profile membership was associate with demographic characteristics. Demographic characteristics included age, race/ethnicity, gender, and home language Unstandardized beta coefficients and odds ratios (ORs) were reported. ORs with a value greater than 1 indicate the increased likelihood of membership in a particular profile (compared with a reference profile) for every unit of increase in the predictor variable (Collie et al., 2019).

In addition, to better understand how profiles of AtL may be distinct from other similar constructs and to determine the theoretical validity of the classes, additional variables were examined to validate profile membership (Turpyn et al., 2015). In this case, executive function, peer sociability, and behavior concerns were used to understand the characteristics of the profiles better. This approach enables one to validate differences of the profiles using information not included in the classification (King, Eastman, Grinell-Davis & Aparicio, 2019). One-way

ANOVAs were conducted with class membership as the independent variable, with Post hoc analysis using Tukey's HSD (Kim, 2013).

Finally, to address RQ3, a series of multilevel regression models were conducted to predict distal academic outcomes from profile membership, controlling for a set of child characteristics. This is to determine whether any gains in academic achievement over time are associated with profile membership. These models were specified separately for four dependent variables: Expressive One-Word vocabulary test, Woodcock-Johnson Applied Problems, Woodcock-Johnson Letter Word Identification, and the Bracken. Each of these models included the Type=Complex specification in *Mplus* to account for the interdependence of data from children nested within classrooms by correcting the standard errors of the child-level variables. Based on the results of the logistic regression and to ensure parsimony in the model, child-level covariates included gender, home language, and fall achievement scores.

Results

Descriptive Statistics

The means and correlations for the study variables are included in Table 3. Raw scores are presented, although z scores were used for analysis. Overall, the variables were strongly correlated. The DECA scale items demonstrated high levels of inter-correlation, around 0.60 *p=.001*. The other items were also significantly correlated, although not as high. Table 4 presents the correlations among the validation measures. The correlations were all in the expected directions. The EF measures were moderately correlated (ranging from r = .2 to r = .47, p =.01). The academic measures were also highly correlated (ranging from r = .43 to r = .60, p *=.01*).

Table 3

Descriptive Statistics and Correlations among Approaches to Learning Measures

Variables	M	SD	Range	1.	2.	3.	4.	5.
1. DECA Initiative	50.03	10.18	28-72					
2. DECA Self-Regulation	49.77	9.99	28-70	.62**				
3. DECA Attachment	51.02	10.22	29-71	.65**	.59**			
4. inCLASS Task Orientation	4.77	.98	1-7	.26**	.22**	.29**		
5. inCLASS Self-Reliance	2.95	1.11	1-7	.19**	.16*	.13*	.41**	
6. Leiter-R Attention	11.14	2.83	2-14	.22**	.26**	.06	.14	.15

Note: DECA = Devereaux Early Childhood Assessment. ** p<.01, * p < .05

Profiles of Approaches to Learning

Successive LPA models were estimated though a 5-class solution. Model fit for classes 1-5 is presented in Table 5. Overall, the 3, 4, and 5 class solutions presented the best model fit. The two-class solution, which included a high and low group, had the highest entropy values along with significant LMP and BLRT values. The 3-class solution had a reduction in AIC and BIC values, but a decrease in entropy. In this solution, the three classes represented a low, medium, and high group across measures. The four-class solution also saw a reduction in AIC and BIC, but an increase in entropy. This four-class solution separated two middle classes of children, ones who were about average and then one group who had average teacher ratings but low attention scores. While interesting, the four-profile solution does not provide any theoretical contributions. Finally, the five-class solution also saw a reduction in AIC and BIC with a slight increase in entropy. Although this model did have a nonsignificant LMP value, the five-class solution was retained because it represented the best combination of both theoretical and

Table 4

Descriptive Statistics and Correlations Among Validation Measures and Distal Outcomes

	M	SD	Range	1.	2.	3.	4.	5.	6.	7.	8.
Academic Measures											
1. Bracken	69.03	13.65	53-130								
2. WJ Johnson Applied Problems	91.93	18.90	127	.60**							
3. WJ Letter Word ID	86.13	29.65	116	.58**	.53**						
4. EOWPVT	94.47	17.37	138	.45**	.53**	.43**					
Executive Function Measures											
5. Digit Span	3.54	2.35	0-11	.41**	.42**	.34**	.29**				
6. HTKS	3.53	7.65	0-41	.28**	.29**	.19**	.20**	.38**			
7. Pencil Tap	7.91	4.80	0-16	.26**	.27**	.27**	.20**	.38**	.47**		
Social Measures											
8. DECA Behavioral Concerns	49.63	9.31	29-71	-.11	-.11	-.10	-.16**	-.24**	-.15**	-.25**	
9. inCLASS Peer Sociability	3.05	1.06	1-7	.17**	.12	.17*	.16*	.09	.15*	.15	-.16*

Note: WJ = Woodcock Johnson. EOWPVT=Expressive One Word Picture Vocabulary Test.. HTKS=Head Toes Knees Shoulders Task. DECA = Devereaux Early Childhood Assessment. ** p<.01, * p < .05

statistical fit. However, it was able to discern an additional class through greater differentiation of the profiles.

Table 5

Model Fit Indices

Model	Log likelihood	AIC	BIC	SABIC	Entropy	Smallest class %	LMR Value	BLRT	Inter.
1	-2024	4073.81	4120.81	4082.2					
2	-1917.64	3979.29	3964.47	3894.68	81	22	.06	.001	2>1
3	-1862	3788.01	3977.91	3810.4	73	15	.00	.001	3>2
4	-1831	3747.3	3909.9	3776.69	75	7	.06	.001	4>3
5	-1807.33	3718.66	3920.01	3755.04	76	5	.6	.001	5>4

Note: LMP = Lo Mendell Rubin test. BLRT = bootstrap likelihood ratio test. Inter=Interpretation.

Table 6 presents the latent profile membership proportions and means for each of the AtL measures, while Figure 1 graphically depicts the patterns. Multinomial logistic regression was conducted to determine whether class membership could be used to predict demographic characteristics, gender, age categories, home language, and ethnicity. These results are presented in Table 7.

Profile 1, *low approaches to learning*, was the smallest profile (5%) and represented children who had low AtL. The children in this profile were rated low on classroom observations of their independence and involvement with tasks. This group also had the lowest rated attention. In terms of demographics, boys ($\beta = 1.28$, $SE = .62$, $p < .01$) were more likely to be in profile 1 than girls. Children whose home language was Spanish were slightly more likely to be in profile 5 than profile 1 ($\beta = -1.73$, $SE = .98$, $p = .06$).

Profile 2 represented 8% of the sample and is characterized as *social/dependent*. This group had high ratings of adaptive behavior and medium ratings of emotion management and initiative. However, this group had below average attention ($M = -1.46$) and independence scores ($M = -.47$). Compared to profile 5, profile 2 had significantly more male students (β

=1.06, *SE* = .45, p<.05) and students whose home language was Spanish (β = 1.42, *SE* = .76, *p* <.05).

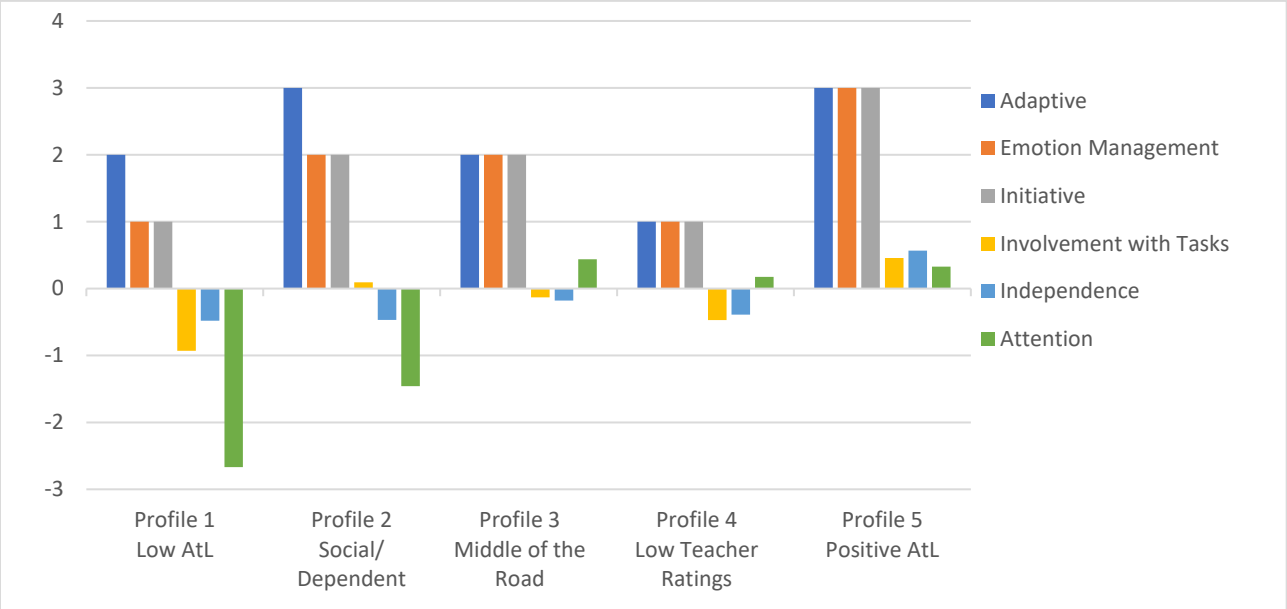
Table 6

Five-Profile Model Results

Variable	Profile 1 Low Approaches to Learning (n=18)	Profile 2 Social Dependent (n=30)	Profile 3 Middle of the Road (n=164)	Profile 4 Low Teacher Ratings (n=26)	Profile 5 Positive Approaches to Learning (n=117)
Adaptive	2	3	2	1	3
Emotion Management	1	2	2	1	3
Initiative	1	2	2	1	3
Involvement with Tasks	-.93	.094	-.130	-.47	.457
Independence	-.48	-.468	-.178	-.39	.568
Attention	-2.669	-1.459	.439	.176	.329

Figure 1

Latent Profiles



Representing 46% of the sample, Profile 3 included children who were generally average across all measures, thus they are characterized as *middle of the road*. They were slightly higher on their attention scores (M = .44), particularly compared to profiles one and two. This group included predominately English speakers (68%) and boys (56%). This group was generally split across racial groups, with each group including approximately 20% of the sample. Finally, this group was more likely to have 3-year olds compared to profile 5 (β = .83, SE = .33, $p < .05$).

Profile 4, *low teacher ratings,* included 7% of the sample. This group was closest in mean values to profile 1, low approaches to learning, however, the children in profile four had slightly higher than average attention (M = .18). This group also had slightly higher scores in independence and attention than profile 1, although these scores were still below average. Similar to profile 1, however, this group was made up of 75% boys. Compared to the highest profile, children in profile 4 were more likely to be male (β=1.39, SE = .52, $p < .01$) and younger children (toddler, β=1.10, SE = .61, p =.06; 3 year olds, β=1.27, SE = .64, p<.05).

Finally, profile 5 (33% of sample) was characterized by children with *positive approaches to learning*. The children in this group were above average across all measures and had the highest scores on all measures. This group was particularly high in teacher-rated adaption, emotion management, and initiative. This group is made up of slightly more girls (57%). This group also has a high percentage of Hispanic children (42%). It is interested to note that children who speak Spanish make up 41% of this group, and that 75% of the Spanish-speaking children are in profiles 3 and 5.

Class Validation

After identifying the subgroups, additional variables were used to validate the differentiation between classes and to better understand the profiles for each. One-way ANOVAs

were conducted with class membership as the independent variable. Post hoc analysis was conducted using Tukey's HSD (Kim, 2015). Validation measures included measures of school readiness, executive function, social skills, and behavioral concerns as rated by the teachers. While low power due to small group size may have prevented more significant differences between the profiles, some interesting trends did emerge. These results are presented in Table 8 and Figure 2 (note, for ease of interpretation of the bar graphs, the validation measures were transposed to Z scores).

Profile 1 had the lowest executive function measures compared to the other profiles. For example, profile 1 had significantly lower digit span values than profile 2 [F (3, 354) = , p=.01] and profile 5 [F (3, 354) = , p=.01]. However, profile 5 had significantly higher digit span scores than the rest of the groups. One of the biggest differences in EF was between profile 4, negative AtL, and profile 5. Interestingly, although the negative AtL had above average scores on attention, they had some of the lowest scores across the three executive function measures. Profiles 2 and 3 did not have statistically significant differences in executive function, although they did have differences in their attention scores. This seems to indicate that attention captures some aspect of behavior that is different that just executive function.

In terms of social skills, the validation measures indicate differences between profiles 1 and profile 4. Whereas profile 1 was characterized by low approaches to learning, they do not have the lowest social skills or peer sociability. Profile 4, the negative AtL, had the highest ratings of behavioral concerns and the lowest ratings of peer sociability. Although this group is able to pay attention, perhaps in one-on-one situations, they struggle in the classroom with their interactions with the teacher and with peers.

Table 7

Multinomial Logistic Regression Model Results for Profile Differences in Demographic Characteristics

	Profile 1 Low AtL (n=18)			Profile 2 Social Dependent (n=30)			Profile 3 Middle of the Road (n=164)			Profile 4 Low Teacher Ratings (n=26)		
	β	se	OR	β	se	OR	B	se	OR	β	se	OR
Male (n=175)	**1.28***	.62	3.57	**1.06***	.45	2.91	.50ᵀ	.27	1.64	**1.39****	.52	3.99
Ethnicity												
Black (n=77)	1.63	1.49	5.13	.94	.76	2.56	.12	.40	1.13	-.21	.68	.81
Hispanic (n=113)	.05	1.04	1.05	-57	.78	.56	-1.05*	.50	.35	-.96	.65	.38
Other (n=)	**2.63***	1.31	13.97	**1.37ᵀ**	.77	3.94	.72	.46	2.05	**.17**	.72	1.19
Home Language												
Spanish (n=125)	**-1.73ᵀ**	.98	.17	**1.42***	.76	.24	-.35	.48	.67	-.11	.60	1.51
Age												
Toddler (n=79)	.33	.71	1.38	-.97	.69	.38	.55	.35	1.73	**1.10ᵀ**	.64	3.02
3 Years Old (n=115)	.34	.67	1.41	.06	.49	1.07	**.83***	.33	2.29	**1.27***	.61	3.58

Note: The regression overall is contrasted with Profile 5, Positive AtL. The coefficients for ethnic groups are contrasts with whites. The Home language is contrasted with English. The age is contrasted with 4-year olds. ᵀp < .10; *p < .05; **p <. 01.

Table 8

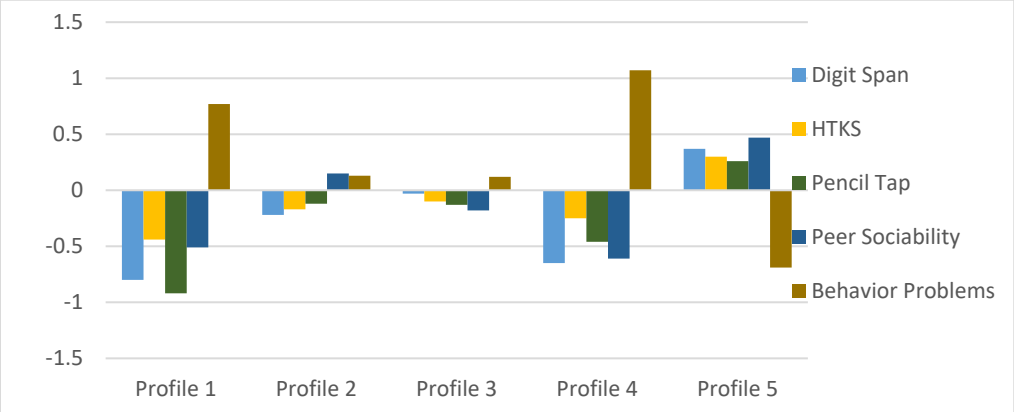
Between-Profile Mean Differences on Concurrent Validation Measures

	Profile 1 Low Approaches to Learning (n=18)	Profile 2 Social Dependent (n=30)	Profile 3 Middle of the Road (n=164)	Profile 4 Low Teacher Ratings (n=26)	Profile 5 Positive Approaches to Learning (n=117)
Executive Function Measures					
Digit Span	1.64[bd]	3.00[g]	3.47[i]	2.00[j]	4.41
HTKS	.13[d]	2.20	2.73[i]	1.65	5.58
Pencil Tap	3.20	7.08	7.03	5.43	8.97
Social Development Measures					
DECA Behavioral Concerns	57.69[d]	51.33[fg]	51.20[hi]	60.71[j]	43.07
inCLASS Peer Sociability	2.46[d]	3.22	2.84[h]	2.34 [j]	3.60

Note: HTKS = Head Toes Knees and Shoulders. DECA = Devereaux Early Childhood Assessment. Means indicated with a superscript reflect significant differences. A= Difference between 1, 2, B=Difference between 1, 3, C=Difference between 1, 4, D=Difference between 1,5, E=Difference between 2, 3
F=Difference between 2, 4, G=Difference between 2, 5, H=Difference between 3, 4, I=Difference between 3, 5
J=Difference between 4, 5

Figure 2

Validation Measures Across Profiles



Predicting Children's Academic Outcomes from Profile Membership

In the final step of the analysis, a series of regression models were conducted to examine whether profile membership predicted children's spring academic outcomes (see Table 9). All models controlled for child gender, fall academic achievement, and home language. Given the previous literature that AtL was associated with positive academic outcomes, it was expected that the profile with high AtL would also have high academic achievement. Profile 1, those with low approaches to learning, had the lowest academic achievement across the profiles, while profile 5, those with high approaches to learning, had the highest academic achievement across measures.

In terms of vocabulary, Profile 2, social/dependent, had significantly lower expressive vocabulary scores compared to the other profiles. For math achievement, profile 1, low AtL, and profile 2, social/dependent, and profile 4, low teacher ratings, had significantly lower math scores than the high AtL profile. Boys also had higher math scores than girls ($\beta = 1.14, p < .01$), which was the only significant gender difference. The Bracken, which is an overall measure of children's school readiness, including letters, shapes, colors, and numbers was significantly lower for profile 1 ($p < .01$) than the other profiles. Children whose home language was Spanish had significantly higher Bracken scores ($\beta = 2.49, p < .05$). Finally, letter identification, class 2, social/dependent, had significantly lower letter identification compared to the other classes ($p = .01$).

Table 9

Regression Models Predicting Academic Outcomes from Profiles

	EOWPVT		WJ Applied Problems		Bracken		WJ Letter Word ID	
	β	*SE*	β	*SE*	B	*SE*	β	*SE*
Profile 1 Low AtL	-.86	2.95	**-10.71****	9.06	**-7.91***	2.16	-3.78	-1.3
Profile 2 Social/Dep.	**-4.06***	1.77	**-3.70ᵀ**	4.16	-2.06	-1.10	**-5.93****	-3.28
Profile 3 Middle of the Road	-1.19	1.26	-1.54	3.30	-.73	-.50	-1.65	-.87
Profile 4 Low Teacher Ratings	-.88	3.67	**-7.04***	8.89	-1.31	-.62	-3.53	-.99
Boys	.76	.98	**1.14****	3.97	-1.19	-.97	.97	.64
Spanish Speaking	-.57	1.17	3.00	5.96	2.49*	2.16	**3.27***	1.96

Note: WJ = Woodcock Johnson. EOWPVT=Expressive One-Word Picture Vocabulary Test. All models control for nesting within classrooms. Class 5, Females, and English Speaking are reference groups; ** p<.01, *p <.05, ᵀ p <.10

Discussion

AtL represents adaptive responses to the learning environment, and associations with child outcomes have been identified as a topic of interest (Domínguez et al., 2010; Kagan et al., 1995). The purpose of this study was to explore whether children demonstrate distinct profiles of AtL and the potential relationship between profiles and various academic and social outcomes. This person-centered approach revealed meaningful subgroups of children with distinct profiles of AtL, including profiles of positive, negative, and low AtL. These profiles differed in their academic achievement and executive function, highlighting the importance of person-centered approaches in explaining different profiles of children's adjustment.

In many ways, AtL represents the positive aspect of children's adjustment (George & Greenfield, 2005). How children go about learning in the classroom can include concentrating,

persisting, cooperating, managing frustration, following rules, and trying new things (Barbu et al., 2015; Brock et al., 2009; Li-Grining et al., 2010; Sasser et al., 2015). AtL may serve as a strength-based protective factor for children who are at risk, as studies have shown that children who are higher in AtL had better academic achievement (McWayne & Cheung, 2009; Nesbitt et al., 2015). This study included a profile of children who demonstrated high AtL across multiple perspectives—teacher report, classroom observation, and one-on-one assessments. These were children who demonstrated initiative, curiosity, focus, and independence. In addition, the children in this profile also had the highest academic achievement, lending support to the notion that AtL is vital in providing children foundational learning skills (Li-Grinning et al., 2010; Sung & Wickrama, 2018).

This study revealed several different patterns among children's demographic characteristics and adaptive responses. For example, Profile 5, *high AtL,* included significantly more girls. Li-Grinning et al. (2010) and Bodovski and Youn (2011) also found evidence that early AtL was more beneficial for girls' academic growth. In this study, girls with more positive AtL in the fall were able to sustain more positive interactions with teachers and peers and seek out more opportunities to learn, which was associated with increased academic achievement.

In the opposite vein, boys were more likely to be in profiles 1 and profiles 4, demonstrating either low AtL or more negative patterns of engagement. Matthew, Ponitz, and Morrison (2009) describe the "boy crisis," wherein boys experience higher rates of suspension alongside higher rates of retention or referral for special services. One possible explanatory factor for these gender differences is that girls have stronger behavioral self-regulation abilities. Another possible factor may be due to observer bias, wherein teachers rate boys lower on achievement and behavior (Beaman, Wheldall, & Kemp, 2006). In this study, children in profiles

1 and 4 were rated lower on teacher-based assessments and observation-based assessments, lending support to possible gender differences in AtL similar to other research findings (Fantuzzo et al., 2007; McWayne et al.,2004). However, Ready, LoGergo, Burkam, and Lee (2005) point out that girls' positive AtL that was more predictive of their academic achievement rather than boys externalizing or problem behavior predicting theirs. This may help account, in part, for the fact that boys in profile 4 had lower AtL, higher problem behaviors, and higher academic achievement; problem behaviors for boys was not associated with academic achievement.

Previous studies have had mixed findings related to AtL, academic achievement, and differences in race/ethnicity, which are often attributable to the rater (Bodovski & Youn, 2011). When studies have found associations, AtL serves as a protective factor for Black or Hispanic children (Bodovski & Youn, 2011; Bustamente & Hindman, 2020). In particular, Latino children have demonstrated increased social-emotional skills, which may in turn, support their academic achievement (Crosnoe, 2007). Galdino and Fuller (2010) found that Latino children had higher AtL than other ethnic groups and that AtL was the strongest predictor of growth in children's math scores. Similarly, Latino children in this study were more likely to be in Profile 5, the profile with the highest academic achievement. AtL represents an adaptive, strength-based profile that Latino children possess (Bustamante & Hindman, 2020).

LPA has been used in previous studies to detect mixed profiles of adaptive responses--children whose distinctiveness may otherwise be lost when comparing across groups(Hair et al., 2006; Litkowski et al, 2020). Indeed, this study was able to differentiate between children who had low AtL (profile 1) and children who demonstrate characteristics that define negative AtL (profile 4). Profile 4, *low teacher ratings*, had higher teacher-reported behavioral concerns

alongside poor social skills. However, this group of children did not have the lowest academic performance, that was profile 1, *low AtL.* Aligned with an explanation offered by Abenavoli et al. (2017), it may be possible that children in profile 1 are not able to engage in the classroom, do not seek opportunities to learn, and have trouble engaging in tasks independently. On the other hand, profile 4, *low teacher ratings,* may be able to leverage their attention/focus on tasks for learning, despite having more teacher-rated behavioral concerns and more negative interactions with peers. Past research shows that when children's approach to learning includes positive interaction, it is associated with increased academic achievement because it helps increase children's opportunities to engage with materials and tasks (DiPerna et al., 2002). It may be that negative engagement in profile 4 is more beneficial for learning outcomes than no engagement (Bulotsky-Shearer, Bell, & Domínguez, 2012).

Finally, LPA has been used in previous research to examine smaller groups of children who may be in need of interventions (Racz et al., 2016). In this case, profile 2 emerged as a possible profile with attention/concentration problems. While this profile did not have particularly low academic achievement, the low attention of these children should be further explored. This profile was characterized by a slightly higher proportion of children who were Hispanic and who may be Dual Language Learners. It is possible that what may seem to be inattentive behavior may be children who are working through multiple languages or who are slow to process information (Wanless et al., 2011).

Implications

AtL represents children's various ways in which children navigate the learning environment by testing out a new idea, working collaboratively with adults, problem-solving at the blocks center, or sustaining focus while attempting to complete a puzzle (McDermott et al.,

2014). This study demonstrated the existence of distinct profiles of learning representing the individual ways in which children adapt to the classroom. Kagan et al. (1995) warn that "perhaps no other dimension is so subject to individual variation as approaches toward learning" (p.27). While the American education system has traditionally valued certain learning styles over others, future work should identify a continuum of AtL; this has important implication for both researchers and teachers.

The existence of multiple profiles and the association between AtL and academic achievement highlight the critical role of AtL as a possible source of intervention. AtL represents a malleable construct that is teachable throughout the school day (Chen & McNamee, 2011). Offering purposeful play materials, time for focused exploration, and a consistent schedule can help children develop curiosity, independence, collaboration, and persistence (Sun, Zhang, Chen, Lau, & Rao, 2018). Providing explicit instructions/directions about what paying attention or listening to directions looks like/sounds like can help children develop behaviors that support learning (Ansari & Gershoff, 2015). Teachers can also develop close relationships with students and model enthusiasm for learning and persistence (Hyson, 2008).

Researchers can work to measure and describe profiles of AtL in a more ecologically valid way (Bustamante & Hindman, 2020). As reviewed by Beisly (2020), AtL has been described and measured widely in an attempt to adequately capture elements of cognitive, social, and emotional development. However, equally important to capturing what skills or dispositions children are developing is *how, in what contexts* or with *whom* these skills develop (Chen & McNamee, 2011). Each classroom represents a distinctive learning context with unique child, teacher, and classroom characteristics that can influence the expression of children's AtL.

Researchers must go beyond examining child characteristics in order to contextualize children's AtL, which may require measurements of AtL beyond teacher report or classroom observation.

Limitations and Directions for Future Research

This study had several limitations. First, the DECA, as a measure of AtL presented some measurement issues. Some of the item-level data were kurtotic, indicating that teachers tended to rate children as either high or low with little variability. The individual items were also highly correlated, which presented difficulties in trying to separate variables in the LPA. Finally, some of the items within the DECA lack concrete descriptors that may lead to different interpretations by different raters. One example is the item, 'appears happy when playing with others.' Teachers may disagree over how children demonstrate happiness, and individual children may not display positive emotions similarly.

This study used three different sources of data—teacher report, assessor report, and classroom observation. On the one hand, these multiple methods help to lessen shared method variance, where items appear related but are only so because they are rated by the same person. In this study, however, there were strong correlations within measurement type. The DECA items were highly correlated, as were the inCLASS items. It is possible that what may appear to be differences in profiles is an artifact of method variance. For example, the children in profile 2 were rated highly by their teacher but lower by the assessor, leading one to wonder whether this represents a unique difference in children or the result of different raters.

One final limitation is in the sample size. Although the sample size overall was sufficient for the LPA, there were smaller numbers of children within groups, which led to less power to detect differences. The small group size was particularly evident in profiles 1 and 4. Larger sample size could have allowed greater power to find statistically significant differences between

these groups. Also, this sample represents one Head start program in one geographic area. Although the sample was randomly selected from the broader program enrollees, it is not representative of the national population. Extending the study to multiple cities or Head Start programs will be necessary next step to extend these findings confidently.

Despite these limitations, this study has several strengths. This study utilized a wide range of AtL measures to capture children's adaptions across multiple contexts and reporters. This research also is the first study to investigate AtL using profile analysis. This person-centered approach demonstrated that children do indeed have unique profiles of AtL, including a distinction between low and negative AtL. Finally, this study used a sample that included children from low-income families, many of whom are Hispanic. This demographic group is often understudied, and more research is needed to shed light on the normative adaptations of this growing group of young children (Bustamante & Hindman, 2018).

There are several directions for future research based on this study. One of the most pressing needs is to examine the relationship between high, low, and negative AtL. For example, in what ways are negative AtL distinct from externalizing behaviors and low AtL distinct from internalizing behaviors? While classroom observations are an essential path to answer this question, more research may be needed that explores young children's AtL at home. How do children go about positively or negatively seeking out opportunities for informal learning? This may provide an additional contextual layer to examine the development of AtL.

Additionally, more research is needed to explore contextual variables related to AtL. For example, this study demonstrated gender differences in the profiles of AtL. Are boys less eager to seek out opportunities to learn? Are girls rated more compliant and so seem to have better AtL? It will be vital to examine the environmental influences that shape children's expression of

AtL, which could include exploring how teacher-directed or child-directed curricula are associated with children's expression of AtL. As classrooms have become more academically focused, it will become essential to understand how children will continue to demonstrate curiosity, flexibility, and problem-solving (Graue, Ryan, Nocera, Northey, & Wilinski, 2017).

Finally, AtL is a broad, umbrella construct that overlaps with similar constructs in different disciplines. AtL represents a more educationally focused description of children's adaptions to the classroom environment. However, social work focuses more holistically on positive mental health, a term which shares overlap with AtL, but which also includes more positive adaptions to the environment outside education. One possible direction is looking at how attachment is related to children's AtL, based on the notion that children need a positive, secure attachment before feeling confident enough to seek out opportunities to learn. Interdisciplinary research can bring to light the ways in which AtL operates in the classroom and the home environment, and how parents and teachers can help develop children's AtL.

Conclusion

Masten (2001) used the term *ordinary magic* to describe children's adaptions to the world around them. These adaptations were ordinary because they were a normative response to the environment, yet magical perhaps because not all children respond the same way to adversity. As children enter school settings, they interact with unfamiliar adults and peers, and many children learn to follow the rules, share toys, and manage the frustration of puzzle pieces that may not fit (McDermott et al., 2014). They go from center to center, exploring materials, building towers with their friends, and having conversations with their teacher, each time increasing their opportunities to learn (Chen & McNamee, 2011). Children who can successfully navigate across

multiple contexts are demonstrating adaptive magic. In this study, a large portion of children, i.e., those in Profile 5, *high AtL,* had this adaptive magic and had high academic achievement.

Person-centered approaches can bring out different patterns of adjustment. One pattern includes children who have difficulty interacting with their teachers or peers, which, in turn, limits their opportunities to engage in learning (Bulotsky-Shearer, Bell, et al., 2012). However, in this study, LPA identified a small group of children, *low teacher ratings,* who were able to learn despite their social struggles. Another pattern was seen in a group of children, *social/dependent,* who were able to interact well with others but struggle to maintain their attention (Hair et al., 2006). Both groups were able to make gains in their academic achievement, as both relied on distinctive ways of adjusting to the classroom.

Whatever the patterns of adjustment, teachers can help all children develop adaptive learning behaviors by providing them with strategies to manage frustration, modeling language about how to share and get along with peers, or steps for active listening (Ansari & Gershoff, 2015). These strategies help develop foundational learning skills that will support children's successful adaption to the classroom and academic achievement. Teachers can nurture these patterns of ordinary magic by supporting the wide diversity of children's strategies in the classroom, coupled with teaching new ones.

References

Abenavoli, R. M., Greenberg, M. T., & Bierman, K. L. (2017). Identification and validation of school readiness profiles among high-risk kindergartners. *Early Childhood Research Quarterly, 38*, 33–43. doi: 10.1016/j.ecresq.2016.09.001

Ansari, A., & Gershoff, E. (2015). Learning-related social skills as a mediator between teacher instruction and child achievement in Head Start: Learning-related social skills and teacher instruction. *Social Development, 24*(4), 699–715. doi: 10.1111/sode.12124

Arnold, D. H., Kupersmidt, J. B., Voegler-Lee, M. E., & Marshall, N. A. (2012). The association between preschool children's social functioning and their emergent academic skills. *Early Childhood Research Quarterly, 27*(3), 376–386. doi: 10.1016/j.ecresq.2011.12.009

Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using M plus. *Structural Equation Modeling: A Multidisciplinary Journal, 21*(3), 329–341. doi: 10.1080/10705511.2014.915181

Barbu, O. C., Levine-Donnerstein, D., Marx, R. W., & Yaden Jr, D. B. (2013). Reliability and validity of the Devereux Early Childhood Assessment (DECA) as a function of parent and teacher ratings. *Journal of Psychoeducational Assessment, 31*(5), 469–481. doi:10.1177/0734282912467758:

Barbu, O. C., Yaden, D. B., Levine-Donnerstein, D., & Marx, R. W. (2015). Assessing approaches to learning in school readiness: Comparing the Devereux Early Childhood Assessment to an early learning standards-based measure. *AERA Open, 1*(3), 1–15. doi: 10.1177/2332858415593923

Beaman, R., Wheldall K., & Kemp C. (2006). Differential teacher attention to boys and girls in the classroom. *Educational Review, 53*(3), 339-366. doi: 10.1080/00131910600748406

Beisly, A.H. (2020). Approaches to Learning: Conceptualization and measurement of a key school readiness indicator. (Unpublished doctoral dissertation). University of Oklahoma

Bierman, K. L., Torres, M. M., Domitrovich, C. E., Welsh, J. A., & Gest, S. D. (2009). Behavioral and cognitive readiness for school: Cross-domain associations for children attending Head Start. *Social Development, 18*(2), 305–323. doi: 10.1111/j.1467-9507.2008.00490.x

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. doi: 10.1037//0003-066X.57.2.111

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*(2), 647–663. doi: 10.1111/j.1467-8624.2007.01019.x

Bodovski, K., & Youn, M. J. (2011). The long term effects of early acquired skills and behaviors on young children's achievement in literacy and mathematics. *Journal of Early Childhood Research, 9*(1), 4-19. doi: 10.1177/1476718X10366727

Bohlmann, N. L., Downer, J. T., Williford, A. P., Maier, M. F., Booren, L. M., & Howes, C. (2019). Observing children's engagement: Examining factorial validity of the inCLASS across demographic groups. *Journal of Applied Developmental Psychology, 60*, 166–176. doi: 10.1016/j.appdev.2018.08.007

Booren, L. M., Downer, J. T., & Vitiello, V. E. (2012). Observations of children's interactions with teachers, peers, and tasks across preschool classroom activity settings. *Early Education and Development, 23*(4), 517–538. doi: 10.1080/10409289.2010.548767

Bracken, B. A. (2007). *Bracken basic concept scale-revised.* (3rd ed.). San Antonio, TX: Psychological Corporation.

Brock, L. L., Rimm-Kaufman, S. E., Nathanson, L., & Grimm, K. J. (2009). The contributions of 'hot' and 'cool' executive function to children's academic achievement, learning-related behaviors, and engagement in kindergarten. *Early Childhood Research Quarterly, 24*(3), 337–349. doi: 10.1016/j.ecresq.2009.06.001

Bull, R., Espy, K. A., & Senn, T. E. (2004). A comparison of performance on the Towers of London and Hanoi in young children. *Journal of Child Psychology and Psychiatry, 45*(4), 743–754. doi: 10.1111/j.1469-7610.2004.00268.x

Bulotsky-Shearer, R., Bell, E. R., & Domínguez, X. (2012). Latent profiles of problem behavior within learning, peer, and teacher contexts: Identifying subgroups of children at academic risk across the preschool year. *Journal of School Psychology, 50*(6), 775–798. doi: 10.1016/j.jsp.2012.08.001

Bulotsky-Shearer, R., Dominguez, X., & Bell, E. R. (2012). Preschool classroom behavioral context and school readiness outcomes for low-income children: A multilevel examination of child- and classroom-level influences. *Journal of Educational Psychology, 104*(2), 421–438. doi: http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0026301

Bulotsky-Shearer, R., & Fantuzzo, J. W. (2011). Preschool behavior problems in classroom learning situations and literacy outcomes in kindergarten and first grade. *Early Childhood Research Quarterly, 26*(1), 61–73. doi: 10.1016/j.ecresq.2010.04.004

Bulotsky-Shearer, R., Fernandez, V., Dominguez, X., & Rouse, H. L. (2011). Behavioral problems in learning activities and social interaction in Head Start classrooms and early reading math and approaches to learning. *School Psychology Review, 40*(1), 39–56. doi: 10.1080/02796015.2011.12087727

Bustamante, A. S., & Hindman, A. H. (2018). Construyendo en la Fuerza: Approaches to learning and school readiness gains in Latino children served by Head Start. *Early Childhood Research Quarterly*. doi: 10.1016/j.ecresq.2018.06.003

Bustamante, A. S., White, L. J., & Greenfield, D. B. (2018). Approaches to learning and science education in Head Start: Examining bidirectionality. *Early Childhood Research Quarterly*, *44*, 34–42. doi: 10.1016/j.ecresq.2018.02.013

Campbell, S. B., & von Stauffenberg, C. (2008). Child characteristics and family processes that predict behavioral readiness for school. In A. Booth & A. Crouter (Eds.), *Early disparities in school readiness: How families contribute to transitions into school* (pp. 225–258). New York: Lawrence Erlbaum Associates, Inc.

Cantor, P., Osher, D., Berg, J., Steyer, L., & Rose, T. (2019). Malleability, plasticity, and individuality: How children learn and develop in context. *Applied Developmental Science*, *23*(4), 307–337. doi: 10.1080/10888691.2017.1398649

Caughy, M. O., & Owen, M. T. (2015). Cultural socialization and school readiness of African American and Latino preschoolers. *Cultural Diversity & Ethnic Minority Psychology*, *21*(3), 391–399. doi: 10.1037/a0037928

Celeux, G., & Soromenho, G. (1996). An entropy criterion for assessing the number of clusters in a mixture model. *Journal of Classification*, *13*(2), 195–212. https://www-springer-com.ezproxy.lib.ou.edu/journal/357

Cerda, C. A., Im, M. H., & Hughes, J. N. (2014). Learning-related skills and academic achievement in academically at-risk first graders. *Journal of Applied Developmental Psychology*, *35*(5), 433–443. doi: 10.1016/j.appdev.2014.08.001

Chen, J.-Q., Masur, A., & McNamee, G. (2011). Young children's approaches to learning: A sociocultural perspective. *Early Child Development and Care*, *181*(8), 1137–1152. doi: 10.1080/03004430.2010.520160

Chen, J.-Q., & McNamee, G. D. (2011). Positive approaches to learning in the context of preschool classroom activities. *Early Childhood Education Journal*, *39*(1), 71–78. doi: 10.1007/s10643-010-0441-x

Collie, R. J., Martin, A. J., Nassar, N., & Roberts, C. L. (2019). Social and emotional behavioral profiles in kindergarten: A population-based latent profile analysis of links to socio-educational characteristics and later achievement. *Journal of Educational Psychology*, *111*(1), 170–187. doi: 10.1037/edu0000262

Crane, J., Mincic, M. S., & Winsler, A. (2011). Parent–teacher agreement and reliability on the Devereux Early Childhood Assessment (DECA) in English and Spanish for ethnically diverse children living in poverty. *Early Education and Development*, *22*(3), 520–547. doi: 10.1080/10409289.2011.565722

Crosnoe, R. (2006). *Mexican roots, American schools: Helping Mexican immigrant children succeed.* Stanford, CA: Stanford University Press.

Denham, S., Bassett, H. H., Mincic, M., Kalb, S., Way, E., Wyatt, T., & Segal, Y. (2012). Social-emotional learning profiles of preschoolers' early school success: A person-centered approach. *Learning and Individual Differences*, *22*(2), 178–189. doi: 10.1016/j.lindif.2011.05.001

Denham, S., Bassett, H. H., Way, E., Mincic, M., Zinsser, K., & Graling, K. (2012). Preschoolers' emotion knowledge: Self-regulatory foundations, and predictions of early school success. *Cognition & Emotion*, *26*(4), 667–679. doi: 10.1080/02699931.2011.602049

DiPerna, J. C., Volpe, R. J., & Elliott, S. N. (2002). A model of academic enablers and elementary reading/language arts achievement. *School Psychology Review*, *31*(3), 298–312. https://www-tandfonline-com.ezproxy.lib.ou.edu/toc/uspr20/current

Dobbs, J., Doctoroff, G. L., Fisher, P. H., & Arnold, D. H. (2006). The association between preschool children's socio-emotional functioning and their mathematical skills. *Journal of Applied Developmental Psychology*, *27*(2), 97–108. doi: 10.1016/j.appdev.2005.12.008

Domínguez, X., Vitiello, V. E., Fuccillo, J. M., Greenfield, D. B., & Bulotsky-Shearer, R. (2011). The role of context in preschool learning: A multilevel examination of the contribution of context-specific problem behaviors and classroom process quality to low-income children's approaches to learning. *Journal of School Psychology*, *49*(2), 175–195. doi: 10.1016/j.jsp.2010.11.002

Domínguez, X., Vitiello, V. E., Maier, M. F., & Greenfield, D. B. (2010). A Longitudinal Examination of Young Children's Learning Behavior: Child-Level and Classroom-Level Predictors of Change Throughout the Preschool Year. *School Psychology Review*, *39*(1), 29–47. doi: 10.1080/02796015.2010.12087788

Downer, J., Booren, L. M., Hamre, B., Pianta, R., & Williford, A. P. (2012). *The Individualized Classroom Assessment Scoring System (inClass): PreK coding manual*. Charlottesville, VA: Center for Advanced Study of Teaching and Learning.

Downer, J. T., Booren, L. M., Lima, O. K., Luckner, A. E., & Pianta, R. C. (2010). The Individualized Classroom Assessment Scoring System (inCLASS): Preliminary reliability and validity of a system for observing preschoolers' competence in classroom interactions. *Early Childhood Research Quarterly*, *25*(1), 1–16. doi: 10.1016/j.ecresq.2009.08.004

Downer, J. T., & Pianta, R. C. (2006). Academic and cognitive functioning in first grade: Associations with earlier home and child care predictors and with concurrent home and classroom experiences. *School Psychology Review*, *35*(1), 11–30. https://www-tandfonline-com.ezproxy.lib.ou.edu/toc/uspr20/current

Elliott, L. (2019). Profiles of academic, cognitive, and behavioral development from kindergarten to third grade. *Learning and Individual Differences, 70*, 109–120. doi: 10.1016/j.lindif.2019.01.010

Fantuzzo, J., Bulotsky-Shearer, R., Fusco, R. A., & McWayne, C. (2005). An investigation of preschool classroom behavioral adjustment problems and social–emotional school readiness competencies. *Early Childhood Research Quarterly*, *20*(3), 259–275. doi: 10.1016/j.ecresq.2005.07.001

Fantuzzo, J., Bulotsky-Shearer, R., McDermott, P., McWayne, C., Frye, D., & Perlman, S. (2007). Investigation of dimensions of social-emotional classroom behavior and school readiness for low-income urban preschool children. *School Psychology Review*, *36*(1), 44–62. Retrieved from https://naspjournals.org/loi/spsr

Fantuzzo, J., Perry, M. A., & McDermott, P. (2004). Preschool approaches to learning and their relationship to other relevant classroom competencies for low-income children. *School Psychology Quarterly*, *19*(3), 212–230. doi: 10.1521/scpq.19.3.212.40276

Ferguson, S. L., G. Moore, E. W., & Hull, D. M. (2019). Finding latent groups in observed data: A primer on latent profile analysis in Mplus for applied researchers. *International Journal of Behavioral Development*, 1-11. doi: 10.1177/0165025419881721

Fitzpatrick, C., & Pagani, L. S. (2013). Task-oriented kindergarten behavior pays off in later childhood. *Journal of Developmental & Behavioral Pediatrics, 34*(2), 94–101. doi: 10.1097/DBP.0b013e31827a3779

Fuhs, M., Farran, D. C., & Nesbitt, K. T. (2015). Prekindergarten children's executive functioning skills and achievement gains: The utility of direct assessments and teacher ratings. *Journal of Educational Psychology*, *107*(1), 207–221. doi: http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0037366

Gardner, M. F. (1990). *EOWPVT-R: Expressive One-word Picture Vocabulary Test, Revised*. Novato, CA: Academic Therapy Publications.

Gathercole, S. E., & Pickering, S. J. (2000). Working memory deficits in children with low achievements in the national curriculum at 7 years of age. *British Journal of Educational Psychology*, *70*(2), 177–194. doi: 10.1348/000709900158047

George, J., & Greenfield, D. B. (2005). Examination of a structured problem-solving flexibility task for assessing approaches to learning in young children: Relation to teacher ratings and children's achievement. *Journal of Applied Developmental Psychology*, *26*(1), 69–84. doi: 10.1016/j.appdev.2004.10.006

Graue, M. E., Ryan, S., Nocera, A., Northey, K., & Wilinski, B. (2017). Pulling preK into a K-12 orbit: The evolution of preK in the age of standards. *Early Years*, *37*(1), 108–122. doi: 10.1080/09575146.2016.1220925

Graziano, P. A., & Hart, K. (2016). Beyond behavior modification: Benefits of social–emotional/self-regulation training for preschoolers with behavior problems. *Journal of School Psychology*, *58*, 91–111. doi: 10.1016/j.jsp.2016.07.004

Graziano, P. A., Slavec, J., Hart, K., Garcia, A., & Pelham, W. E. (2014). Improving school readiness in preschoolers with behavior problems: Results from a summer treatment program. *Journal of Psychopathology and Behavioral Assessment*, *36*(4), 555–569. doi: 10.1007/s10862-014-9418-1

Hair, E., Halle, T., Terry-Humen, E., Lavelle, B., & Calkins, J. (2006). Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade. *Early Childhood Research Quarterly*, *21*(4), 431–454. doi: 10.1016/j.ecresq.2006.09.005

Hoff, E., & Ribot, K. M. (2017). Language growth in English monolingual and Spanish-English bilingual children from 2.5 to 5 years. *The Journal of Pediatrics*, *190*, 241-245.e1. doi: 10.1016/j.jpeds.2017.06.071

Hooper, S. R., Roberts, J., Sideris, J., Burchinal, M., & Zeisel, S. (2010). Longitudinal predictors of reading and math trajectories through middle school for African American versus Caucasian students across two samples. *Developmental Psychology*, *46*(5), 1018–1029. doi: 10.1037/a0018877

Howard, M. C., & Hoffman, M. E. (2018). Variable-Centered, Person-Centered, and Person-Specific Approaches: Where Theory Meets the Method. *Organizational Research Methods*, *21*(4), 846–876. doi: 10.1177/1094428117744021

Hyson, M. (2008). *Enthusiastic and engaged learners*. New York, NY: Teachers College Press.

Kagan, S., Moore, E., & Bredekamp, S. (1995). *Reconsidering children's early learning and development: Toward common views and vocabulary*. Washington, DC: National Education Goals Panel.

Kim, H.-Y. (2015). Statistical notes for clinical researchers: Post-hoc multiple comparisons. *Restorative Dentistry & Endodontics*, *40*(2), 172–176. doi: 10.5395/rde.2015.40.2.172

King, B., Eastman, A. L., Grinnell-Davis, C., & Aparicio, E. (2019). Early childbirth among foster youth: A latent class analysis to determine subgroups at increased risk. *Perspectives on Sexual and Reproductive Health*, *51*(4), 229–238. Retrieved from https://doi-org.ezproxy.lib.ou.edu/10.1363/psrh.12124

Konold, T. R., & Pianta, R. C. (2005). Empirically-derived, person-oriented patterns of school readiness in typically-developing children: Description and prediction to first-grade achievement. *Applied Developmental Science*, *9*(4), 174–187. doi: 10.1207/s1532480xads0904_1

Kontos, S., & Keyes, L. (1999). An ecobehavioral analysis of early childhood classrooms. *Early Childhood Research Quarterly*, *14*(1), 35–50. doi: 10.1016/S0885-2006(99)80003-9

LeBuffe, P., & Naglieri, J. (2012). *The Devereux Early Childhood Assessment for Preschoolers, Second Edition (DECA-P2) Assessment, Technical Manual and User's Guide*. Lewisville, NC: Kaplan.

LeBuffe, P., & Shapiro, V. (2004). Lending "strength" to the assessment of preschool social-emotional health. *The California School Psychologist, 9*, 51–61. doi: 10.1007/BF03340907

Lien, M. T., & Carlson, J. S. (2009). Psychometric properties of the Devereux Early Childhood Assessment in a Head Start sample. *Journal of Psychoeducational Assessment, 27*(5), 386–396. doi: 10.1177/0734282909331754

Li-Grining, C. P., Votruba-Drzal, E., Maldonado-Carreno, C., & Haas, K. (2010). Children's early approaches to learning and academic trajectories through fifth grade. *Developmental Psychology, 46*(5), 1062–1077. doi: 10.1037/a0020066

Litkowski, E. C., Finders, J. K., Borriello, G. A., Purpura, D. J., & Schmitt, S. A. (2020). Patterns of heterogeneity in kindergarten children's executive function: Profile associations with third grade achievement. *Learning and Individual Differences, 80*, 101846. doi: 10.1016/j.lindif.2020.101846

Mahy, C. E. V., & Moses, L. J. (2011). Executive functioning and prospective memory in young children. *Cognitive Development*, S0885201411000384. doi: 10.1016/j.cogdev.2011.06.002

Martin, N. A., & Brownell, R. (2011). *Expressive one-word picture vocabulary test* (4th ed.). Novato, CA: Academic Therapy Publications.

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56*(3), 227-238. doi: 10.1037/0003-066X.56.3.227

Masten, A. S., & Cicchetti, D. (2016). Resilience in development: Progress and transformation. *Developmental Psychopathology*, 1–63. doi: 10.1002/9781119125556.devpsy406

Masyn, K. E. (2013). 25 latent class analysis and finite mixture modeling. In T. Little (Ed.), *The Oxford Handbook of Quantitative Methods* (pp. 551-611). New York: Oxford University Press

Matthews, J. S., Ponitz, C. C., & Morrison, F. J. (2009). Early gender differences in self-regulation and academic achievement. *Journal of educational psychology, 101*(3), 689. doi: 10.1037/a0014240

McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly, 21*(4), 471–490. doi: 10.1016/j.ecresq.2006.09.003

McClelland, M. M., & Cameron, C. E. (2012). Self-regulation in early childhood: Improving conceptual clarity and developing ecologically valid measures. *Child Development Perspectives, 6*(2), 136–142. doi: 10.1111/j.1750-8606.2011.00191.x

McClelland, M. M., Cameron, C. E., Duncan, R., Bowles, R. P., Acock, A. C., Miao, A., & Pratt, M. E. (2014). Predictors of early growth in academic achievement: The head-toes-knees-shoulders task. *Frontiers in Psychology, 5*. doi: 10.3389/fpsyg.2014.00599

McClelland, M. M., & Morrison, F. J. (2003). The emergence of learning-related social skills in preschool children. *Early Childhood Research Quarterly*, *18*(2), 206–224. doi: 10.1016/S0885-2006(03)00026-7

McDermott, P. A., Leigh, N. M., & Perry, M. A. (2002). Development and validation of the preschool learning behaviors scale. *Psychology in the Schools, 39*(4), 353–365. doi: 10.1002/pits.10036

McDermott, P. A., Rikoon, S. H., & Fantuzzo, J. W. (2014). Tracing children's approaches to learning through Head Start, kindergarten, and first grade: Different pathways to different outcomes. *Journal of Educational Psychology*, *106*(1), 200–213. doi: http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0033547

McDermott, P. A., Rovine, M. J., Reyes, R. S., Chao, J. L., Scruggs, R., Buek, K., & Fantuzzo, J. W. (2018). Trajectories of early education learning behaviors among children at risk: A growth mixture modeling approach. *Psychology in the Schools*, *55*(10), 1205–1223. doi: 10.1002/pits.22145

McWayne, C., & Cheung, K. (2009). A picture of strength: Preschool competencies mediate the effects of early behavior problems on later academic and social adjustment for Head Start children. *Journal of Applied Developmental Psychology*, *30*(3), 273–285. doi: 10.1016/j.appdev.2008.12.014

McWayne, C., Cheung, K., Wright, L. E., & Hahs-Vaughn, D. L. (2012). Patterns of school readiness among head start children: Meaningful within-group variability during the transition to kindergarten. *Journal of Educational Psychology*, *104*(3), 862–878. doi: 10.1037/a0028884

Montroy, J. J., Bowles, R. P., Skibbe, L. E., & Foster, T. D. (2014). Social skills and problem behaviors as mediators of the relationship between behavioral self-regulation and academic achievement. *Early Childhood Research Quarterly, 29*(3), 298–309. doi: 10.1016/j.ecresq.2014.03.002

Morgan, G. B. (2015). Mixed mode latent class analysis: An examination of fit index performance for classification. *Structural Equation Modeling: A Multidisciplinary Journal*, *22*(1), 76–86. doi: 10.1080/10705511.2014.935751

Muthén, B., & Muthén, L. K. (1998). *Mplus User's Guide* (8th ed.). Los Angeles, CA: Muthen & Muthen.

Nesbitt, K. T., Farran, D. C., & Fuhs, M. W. (2015). Executive function skills and academic achievement gains in prekindergarten: Contributions of learning-related behaviors. *Developmental Psychology, 51*(7), 865–878. doi: 10.1037/dev0000021

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*(4), 535–569. doi: 10.1080/10705510701575396

Panter, J. E., & Bracken, B. A. (2009). Validity of the Bracken School Readiness Assessment for predicting first grade readiness. *Psychology in the Schools*, *46*(5), 397–409. doi: 10.1002/pits.20385

Ponitz, C. C., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology, 45*(3), 605–619. doi: 10.1037/a0015365

Pratt, M. E., Swanson, J., van Huisstede, L., & Gaias, L. M. (2019). Cumulative family stressors and kindergarten adjustment: The exacerbating role of teacher–child conflict. *Merrill-Palmer Quarterly*, *65*(1), 28–53. doi: 10.13110/merrpalmquar1982.65.1.0028

Racz, S. J., O'Brennan, L. M., Bradshaw, C. P., & Leaf, P. J. (2016). The influence of family and teacher factors on early disruptive school behaviors: A latent profile transition analysis. *Journal of Emotional and Behavioral Disorders, 24*(2), 67–81. doi: 10.1177/1063426615599541

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2015). Are approaches to learning in kindergarten associated with academic and social competence similarly? *Child & Youth Care Forum, 44*(6), 757–776. doi: 10.1007/s10566-015-9307-0

Ready, D. D., LoGerfo, L. F., Burkam, D. T., & Lee, V. E. (2005). Explaining girls' advantage in kindergarten literacy learning: Do classroom behaviors make a difference?. *The elementary school journal*, *106*(1), 21-38. doi: 10.1086/496905

Reid, E. E., Diperna, J. C., Missall, K., & Volpe, R. J. (2014). Reliability and structural validity of the teacher rating scales of early academic competence. *Psychology in the Schools, 51*(6), 535–553. doi: 10.1002/pits.21769

Rhoades, B. L., Warren, H. K., Domitrovich, C. E., & Greenberg, M. T. (2011). Examining the link between preschool social–emotional competence and first grade academic achievement: The role of attention skills. *Early Childhood Research Quarterly*, *26*(2), 182–191. doi: 10.1016/j.ecresq.2010.07.003

Roesch, S. C., Villodas, M., & Villodas, F. (2010). Latent class/profile analysis in maltreatment research: A commentary on Nooner et al., Pears et al., and looking beyond. *Child Abuse & Neglect*, *34*(3), 155. doi:10.1016/j.chiabu.2010.01.003

Roid, G. H., & Miller, L. J. (1997). *Leiter international performance scale-revised (Leiter-R).* Wood Dale, IL: Stoelting.

Sabol, Terri J., Bohlmann, N. L., & Downer, J. T. (2018). Low-income ethnically diverse children's engagement as a predictor of school readiness above preschool classroom quality. *Child Development, 89*(2), 556–576. doi: 10.1111/cdev.12832

Sabol, T.J., & Pianta, R. C. (2017). The state of young children in the United States: School readiness. In E. Votruba-Drzal & E. Dearing (Eds.), *Handbook of early childhood development programs, practices and policies (pp. 1-17)*. Malden, MA ; Oxford: Wiley and Sons.

Sasser, T. R., Bierman, K. L., & Heinrichs, B. (2015). Executive functioning and school adjustment: The mediational role of pre-kindergarten learning-related behaviors. *Early Childhood Research Quarterly*, *30*, 70–79. doi: 10.1016/j.ecresq.2014.09.001

Smith-Donald, R., Raver, C. C., Hayes, T., & Richardson, B. (2007). Preliminary construct and concurrent validity of the Preschool Self-regulation Assessment (PSRA) for field-based research. *Early Childhood Research Quarterly*, *22*(2), 173–187. doi: 10.1016/j.ecresq.2007.01.002

Stipek, D., Newton, S., & Chudgar, A. (2010). Learning-related behaviors and literacy achievement in elementary school-aged children. *Early Childhood Research Quarterly*, *25*(3), 385–395. doi: 10.1016/j.ecresq.2009.12.001

Sun, J., Zhang, L., Chen, E., Lau, C., & Rao, N. (2018). Preschool attendance and executive function mediate early academic achievement gaps in East Asia and the Pacific. *Early Education and Development*, *29*(8), 1039–1060. doi: 10.1080/10409289.2018.1498999

Sung, J., & Wickrama, K. A. S. (2018). Longitudinal relationship between early academic achievement and executive function: Mediating role of approaches to learning. *Contemporary Educational Psychology*, *54*, 171–183. doi: 10.1016/j.cedpsych.2018.06.010

Tein, J.-Y., Coxe, S., & Cham, H. (2013). Statistical power to detect the correct number of classes in latent profile analysis. *Structural Equation Modeling: A Multidisciplinary Journal*, *20*(4), 640–657. doi: 10.1080/10705511.2013.824781

Turpyn, C. C., Chaplin, T. M., Cook, E. C., & Martelli, A. M. (2015). A person-centered approach to adolescent emotion regulation: Associations with psychopathology and parenting. *Journal of Experimental Child Psychology*, *136*, 1–16. doi: 10.1016/j.jecp.2015.02.009

Ungar, M., Ghazinour, M., & Richter, J. (2013). Annual research review: What is resilience within the social ecology of human development? *Journal of Child Psychology and Psychiatry*, *54*(4), 348–366. doi: 10.1111/jcpp.12025

Vaughn, M. G., DeLisi, M., Beaver, K. M., & Wright, J. P. (2009). Identifying latent classes of behavioral risk based on early childhood: Manifestations of self-control. *Youth Violence and Juvenile Justice*, *7*(1), 16–31. doi: 10.1177/1541204008324911

Wanless, S. B., McClelland, M. M., Tominey, S., & Acock, A. (2011). The influence of demographic risk factors on children's behavioral regulation in prekindergarten and kindergarten. *Early Education & Development, 22*(3), 461–488. doi: 10.1080/10409289.2011.536132

Weiland, C., Barata, M. C., & Yoshikawa, H. (2014). The Co-Occurring development of executive function skills and receptive vocabulary in preschool-aged children: A look at the direction of the developmental pathways *Infant and Child Development, 23*(1), 4–21. doi: 10.1002/icd.1829

West, S. G., Taylor, A. B., Wu, W., & others. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (p. 209–231). New York: The Guilford Press.

Williford, A. P., Whittaker, J. E. V., Vitiello, V. E., & Downer, J. T. (2013). Children's engagement within the preschool classroom and their development of self-regulation. *Early Education and Development, 24*(2), 162–187. doi: 10.1080/10409289.2011.628270

Woodcock, R.W., Mcgrew, K. S., & Mather, N. (2001). *Woodcock-Johnson III Tests of Achievement*. Rolling Meadows, IL: Riverside Publishers.

Yoder, M. L., Williford, A. P., & Vitiello, V. E. (2019). Observed quality of classroom peer engagement in a sample of preschoolers displaying disruptive behaviors. *Early Childhood Research Quarterly*, *47*, 206–217. doi: 10.1016/j.ecresq.2018.12.011

Appendix A: Process for Determining Number of Profiles and Profile Analysis

In the first step, a series of LPA models was estimated based on the items included in the AtL measures. *Mplus* was utilized to conduct LPA and full information maximum likelihood was used to handle missing data (Muthén & Muthén, 1998). By utilizing maximum likelihood testing, LPA incorporates individuals with data from at least one indicator variable (i.e., initiative, attention). Therefore, data from the full sample was used to estimate the latent profiles. To facilitate model interpretation, all continuous variables were standardized with z scores prior to conducting analyses. LPA estimates an individual's probability of membership in each latent class and uses continuous rather than categorical indicators, although it can handle both.

The series of LPA models was estimated beginning with a 1-class solution and adding an additional class in each successive model. Variable means were free to vary across profiles, and variants were set to be equal across profiles for estimation purposes. Multiple random starting values (500 and 250 sets, respectively, for initial and 2000 and 500 for the final stage optimization) were used to check model standability and model identification.

Given that LPA is a model testing process, multiple models are fit with increasing levels of classes (Masyn, 2013). Multiple fit statistics were used to determine the number of profiles within the model. Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are measures of fit that demonstrate relative fit, i.e. they can be used to compare a 1 class model with a 2 class model, with better fit being indicated by a reduction in BIC or AIC (West et al., 2012). Additionally, the SABIC is used; this is a fit measure that adjusts the formula to account for *n* and is less punitive on the number of parameters in the model (Tein, Coxe, & Cham, 2013).

Additionally, SABIC is useful when there are smaller samples and low class separation (Morgan, 2015).

Entropy is another fit statistic that can be used, although some researchers have found a lack of support in simulation studies (Masyn, 2013). Entropy is a measure of uncertainty, ranging from 0-1, with higher numbers indicating less uncertainty. Values of .80 or greater provide evidence that profile classification of individuals occurs with minimal uncertainty (Celeux & Soromenho, 1996). Another measure of fit is the smallest group size, with groups numbering under 5% of the total pool of subjects considered a byproduct of the estimation produced (Roesch et al., 2010).

Two other measures of fit are the Lo, Mendell and Rubin (LMR) test and the bootstrap likelihood ration test, BLRT (Ferguson et al., 2019). The LMR tests the likelihood ration of one model compared to another, with an adjusted x^2. The LMR provides information about whether additional profiles are improving fit in the model, with a nonsignificant LMP test suggesting the more parsimonious model is better fitting. The BLRT similarly tests the model fit of one model versus a model with one less profile by using parameter estimation methods to create multiple bootstrap samples to represent the sampling distributions (Masyn, 2013). A significant BLRT suggests that the model with one more profile is an improvement over a model with one less profile. The standard procedure is to accept the model with the largest amount of classes, smallest BIC value, and a significant LMR, in conjunction with the intelligibility of the profiles (Nylund et al., 2007)

APPENDIX A: PROSPECTUS

APPROACHES TO LEARNING: CONCEPTUALIZATION AND MEASUREMENT OF A KEY SCHOOL READINESS INDICATOR

UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

APPROACHES TO LEARNING: CONCEPTUALIZATION AND MEASUREMENT OF A KEY SCHOOL READINESS INDICATOR

A PROSPECTUS

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

By

AMBER H. BEISLY
Norman, Oklahoma
2019

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Abstract

Children ages 3-5 are more likely to be enrolled in classroom-based preschool programs than ever before (Snyder, de Brey, & Dillow, 2018). This provides children with opportunities to engage socially with peer and teachers and to interact with new materials; these kinds of opportunities are key drivers of early learning in childhood (Hamre & Pianta, 2001). As such, a child's ability to maximize these learning opportunities, termed approaches to learning (ATL), plays a pivotal role in her academic development and adjustment to the school environment. Nonetheless, there is a lack of clarity in both the conceptualization and measurement of ATL, and these problems have resulted in gaps in the understanding of exactly what ATL is and how it contributes to children's school readiness. This study will address these gaps by conceptualizing ATL in classroom-based contexts as well as using Latent Profile Analysis (LPA) to examine profiles of children's ATL and their negative engagement. These profiles will then be used to explore the relationships between different types of ATL and children's math outcomes in a sample of 3- and 4-year-old children participating in a Head Start program.

Keywords: approaches to learning, pre-kindergarten, Head Start, school readiness

Approaches to Learning: Conceptualization and Measurement of a Key School Readiness Indicator

In 1989, the National Education Goals Panel proclaimed that by the year 2000, all children should come to school "ready to learn" (Hunt et al., 1998). At that time, school readiness was conceptualized as a constellation of foundational skills necessary for school success (Russo, Williford, Markowitz, Vitiello, & Bassok, 2019). Approaches to learning (ATL), students' characteristic "ways of responding across situations" was included as one key aspect of school readiness (Kagan et al., 1995, p. 23). Positive learning approaches help children sustain engagement, interact with peers, and manage disappointment (Chen & McNamee, 2011; Fantuzzo et al., 2007; McDermott, Rikoon, & Fantuzzo, 2014). Almost 30 years later, despite its inclusion as a key feature of school readiness and a literature base suggesting it is related to important academic outcomes, researchers struggle with pinpointing what ATL is, how it is manifested in the classroom context and how these manifestations may vary across children (Li-Grining, Votruba-Drzal, Maldonado-Carreno, & Haas, 2010).

Children's first school experiences may represent a particularly sensitive period for the development of key social, emotional, and cognitive skills (Alexander & Entwisle, 1988; Rimm-Kaufman & Pianta, 2000; Thomson, Guhn, Richardson, Ark, & Shoveller, 2017). ATL is particularly important in helping children during the early months of school as they encounter a more structured learning environment and a new set of peers and behavioral demands (Daniels, 2014; Montroy, Bowles, Skibbe, & Foster, 2014). Children with more positive ATL may be able to get along better with classmates, follow the teacher's directions, and redirect distress or frustration (Pratt, Swanson, van Huisstede, & Gaias, 2019). These behaviors lay important

groundwork for learning because they help children establish positive relationships that put them in more frequent contact with learning opportunities (McDermott et al., 2018). However, not all children successfully adjust to the classroom environment. For some children, more problematic behavior can emerge as a function of the mismatch between their developmental capabilities and the requirements of the situation (Bulotsky-Shearer, Bell, & Domínguez, 2012). Children exhibiting these negative learning behaviors are at risk for poor academic outcomes. ATL represents a combination of learning styles believed to be malleable over time; consequently, understanding this construct can provide important information about how to nurture its development in children (Barbu, Yaden, Levine-Donnerstein, & Marx, 2015; McDermott, Rikoon, Waterman, & Fantuzzo, 2012). Given its importance as a school readiness skill, ATL remains a critical pathway in supporting children, families, and classrooms prepare for kindergarten (Bustamante, White, & Greenfield, 2017; Vitiello & Greenfield, 2017).

Previous research has been limited in the measurement of ATL in the early childhood years, which has created gaps in our understanding of how ATL is related to academic outcomes. Many studies using ATL rely solely on retroactive teacher-reports of children's behavior without considering how young children's competencies are embedded within relationships and contexts (Downer, Booren, Lima, Luckner, & Pianta, 2010; Volpe, DiPerna, Hintze, & Shapiro, 2005). As Cerda et al. (2014, p. 12) point out "what is needed is a multi-source measurement model that identifies theoretically distinct LRS (learning-related skills, i.e. ATL) constructs and their relations to academic achievement." A more person-centered approach, like latent profile analysis, could capture meaningful subgroups of children who share common patterns of behavioral responses to the demands of the classroom (Vitiello, Booren, Downer, & Williford, 2012). Research has yet to investigate whether these distinct profiles of approaches to learning

are related to academic outcomes. A more nuanced understanding of the ways in cognitive, social, and emotional domains influence children's learning approaches can help researchers understand the fuller picture of school readiness (Bulotsky-Shearer, Bell, & Domínguez, 2012).

Research Questions

1. Are there three distinct dimensions (social, emotional, and cognitive) of ATL conceptually and empirically? How is this model of ATL distinct from other constructs like executive function?
2. Can different types of ATL be empirically distinguished?
3. Are there profiles which include both positive and negative approaches to learning? In what ways do profiles change when considering negative approaches to learning?
4. How do these different profiles of approaches to learning predict academic outcomes?

Theoretical Framework

This study utilizes a developmental ecological systems perspective exploring child-level factors within the demands of proximal settings (McWayne, Hahs-Vaughn, Cheung, & Wright, 2012). Bronfenbrenner's ecological systems theory (2005) emphasizes that child development is a function of both child characteristics and the nested contexts of the child's environment that may serve to impede or promote the development of school readiness. Micro-level interactions occur via a transactional process, which, over time, forms patterns and relationships that continue to influence children's development (Bronfenbrenner & Morris, 1998). An important part of these interactions are the proximal and distal characteristics of the individuals and the settings in which they are embedded (Downer et al., 2010).

Under this developmental-ecological framework, the child interacts with teachers, peers, and tasks within the classroom setting (see Figure 1). These interactions are viewed as the

primary mechanism through which classrooms afford children opportunities to become engaged in learning, develop social skills, and, ultimately, develop academic competencies (Bailey, Denham, Curby, & Bassett, 2016; Bohlmann et al., 2019)

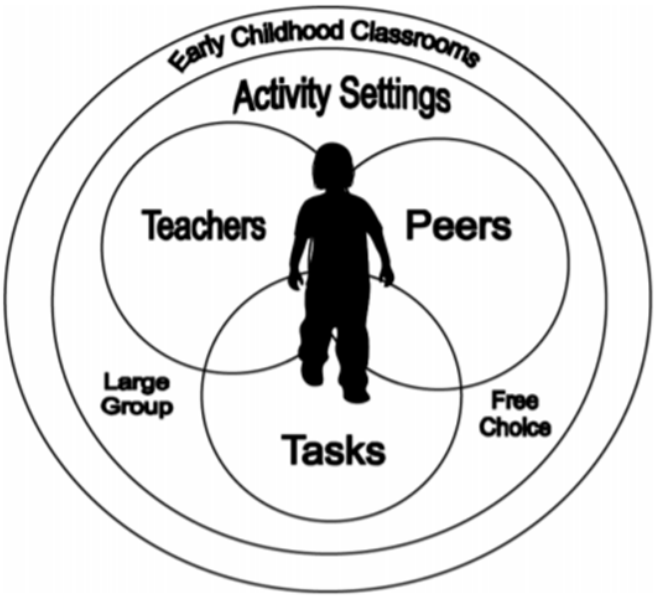


Figure 1. Theoretical Framework of the nested nature of children's interactions. Adapted from Booren, Downer, and Vitiello (2012).

This engagement occurs in different contexts, which can include large group, free choice, or structured learning situations (Sabol, Bohlmann, & Downer, 2018). Children have regular opportunities to interact socially with teachers and peers, although they may not engage in experiences evenly across the day (Booren, Downer, & Vitiello, 2012; Sabol et al., 2018). Importantly, children's engagement with social partners and tasks is a process that drives learning (Hamre & Pianta, 2001)

Children enter preschool with district profiles of self-regulation and attention skills that may facilitate or impede their engagement with peers, teachers and instructional opportunities in a transactional nature (Degnan, Calkins, Keane, & Hill-Soderlund, 2008). The child's ability to

get the most out of his/her classroom experiences may maximize the child's opportunities to learn and develop within the classroom (Downer, Booren, Lima, Luckner, & Pianta, 2010b). Children with greater competence have more positive behaviors and relationship skills that allow them to engage more effectively in learning and with others who can support their progress (Denham & Brown, 2010).

While child characteristics within the classroom context can support positive engagement and learning, the ecological systems perspective also accounts for how these same characteristics and contexts can lead to more negative outcomes. Some children experience negative classroom engagement, characterized by tense, conflictual and dysregulated engagement with teachers, peers, and tasks (Bulotsky-Shearer et al., 2012; Bulotsky-Shearer, Fernandez, Dominguez, & Rouse, 2011; Fantuzzo, Bulotsky-Shearer, Fusco, & McWayne, 2005; Vitiello et al., 2012). Children's negative engagement with teachers, often expressed as defiance or verbal outbursts, or peers, expressed as aggressive behavior, and tasks (e.g., lack of behavioral control) may affect their ability to benefit from the social and instructional support in the classroom (Ladd & Burgess, 2001). Negative engagement reduces children's opportunities to interact with teachers and peers, and moreover, could serve as a stressor that interferes with children's development of self-regulatory skills (Sabol et al., 2018). If children's behavior is misaligned with the expectations of the setting, a negative feedback loop is created wherein lower inhibitory skills lead to a less positive attitude towards learning, reduced attention and then lower inhibitory skills (Bulotsky-Shearer et al., 2011). These early problems with adjustment may place children at risk for future learning difficulties (Lutz, Fantuzzo, & McDermott, 2002).

Review of Literature

This section provides a review of the current conceptualization of ATL as a classroom-based construct and as a continuum of both positive and negative behavior. In addition, the measurement of ATL will be explored, highlighting the possible limitations of current approaches as well as the possibility of Latent Profile Analysis (LPA) as a person-centered approach that may address the multi-dimensionality of ATL. Finally, given ATL is an important school readiness indicator, the relationship between ATL and academic outcomes is reviewed.

Conceptualization of Approaches to Learning

ATL is a multidimensional construct developing rapidly between pre-k and kindergarten and then stabilizing in early childhood (Bulotsky-Shearer et al., 2011; McDermott et al., 2014). Current research on ATL includes a wide diversity of characteristics that varies from study to study (Fantuzzo, Perry, & McDermott, 2004; McDermott et al., 2014). However, ATL is generally described as a broad set of skills that reflect children's engagement in classroom interactions and activities (Hyson, 2008; McDermott et al., 2014; Stipek, Newton, & Chudgar, 2010).

McDermott et al. (2018, p. 1206) describe learning behaviors as rooted in key domains of development (social, emotional, and cognitive) and "empirically supported by extensive literature in each domain." From the social domain, ATL includes behaviors such as cooperation, verbal interaction and interpersonal responsiveness (McClelland & Morrison, 2003). Cognitive dimensions include strategic planning as well as the ability to sustain attention. It is derived yet distinct from executive function (Nelson et al., 2017). Finally, emotional components of ATL include inhibition and exploratory behavior (Zentner & Bates, 2008). What essentially distinguishes ATL is that the construct includes the social, emotional, and cognitive aspects of observable learning behaviors that direct classroom engagement (McDermott et al., 2018). This

study relies on Hyson's (2008) partitioning of positive ATL, being enthusiastic and engaged in learning and negative ATL, which is characterized as disengagement and discouragement (see Figure 2). McDermott et al.'s (2018) inclusion of the three domains of ATL is also utilized.

ATL as classroom-based behavior. Kagan et al. (1995, p. 23) described ATL as a set of learning dispositions that "include[s] variances that affect how children attitudinally address the learning process." Behaviors classified as ATL are those that promote learning (Bierman, Torres, Domitrovich, Welsh, & Gest, 2009; Cerda et al., 2014; Fantuzzo et al., 2007; Razza, Martin, & Brooks-Gunn, 2012). This includes behaviors like cooperating with other children, paying attention to the teacher, sustaining attention, listening and following directions, organizing work materials, and completing tasks when asked (Li-Grining, Votruba-Drzal, Maldonado-Carreno, & Haas, 2010; McClelland, Acock, & Morrison, 2006; McDermott et al., 2014; Neuenschwander, Röthlisberger, Cimeli, & Roebers, 2012). ATL is not tied to a specific *content* area, like math or literacy (Elliot, 2019). Rather, it is *context*-specific, describing how children learn across various tasks and go about the classroom in an effortful and purposeful way (Chen & McNamee, 2011; McDermott et al., 2014).

These classroom-based definitions highlight how multiple components of emotional, social, and cognitive skills can be combined in the service of learning (Sung & Wickrama, 2018). For example, some researchers have highlighted the cognitive aspects of ATL, focusing on ATL as planfulness and goal orientation (Fantuzzo et al., 2007). Ursache, Blair, and Raver (2012) argue that ATL relies on executive function skills, like working memory, and effortful control, the ability to control reactivity. Other researchers believe that it is a combination of affective,

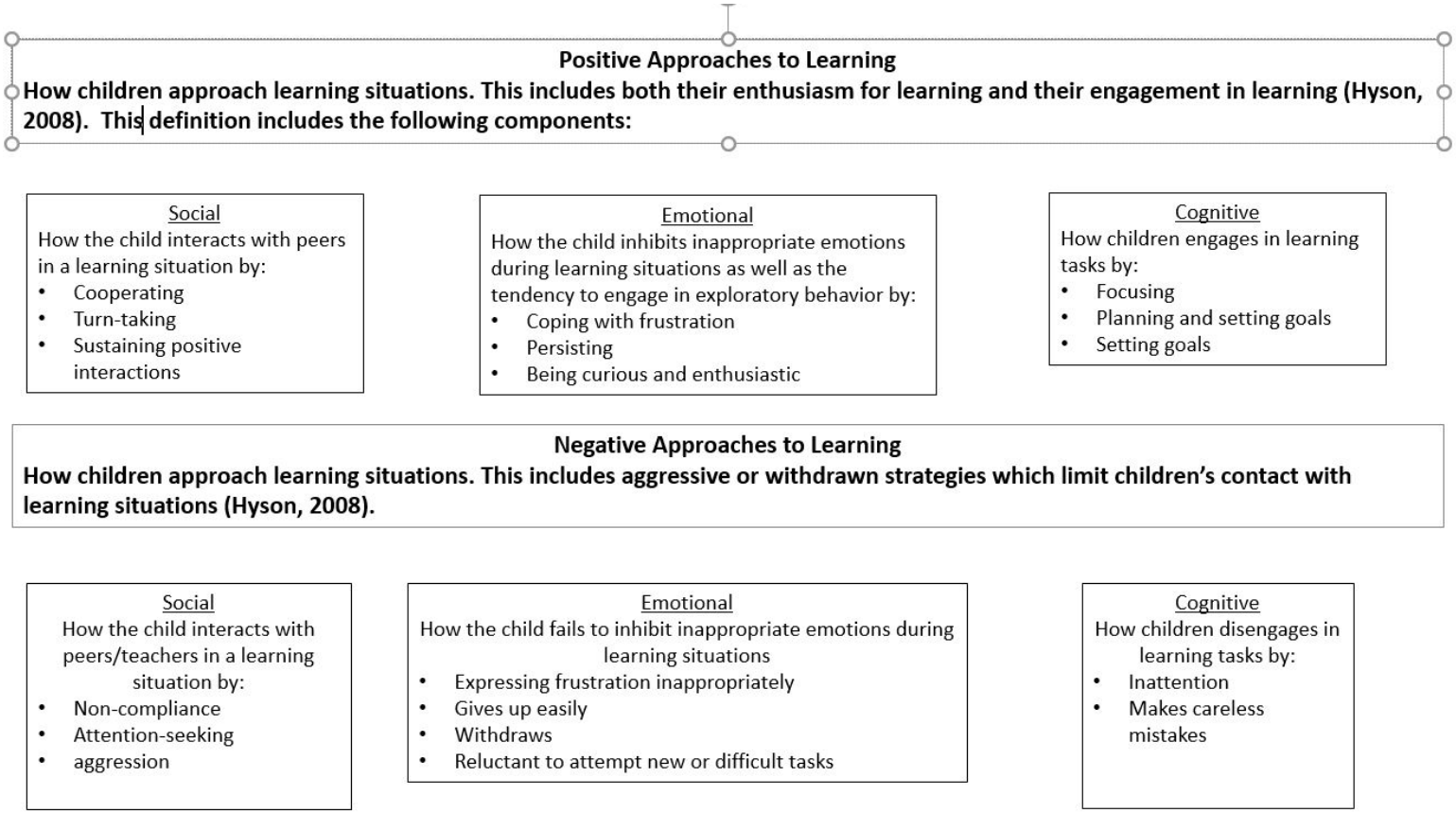


Figure 2. Conceptualization of approaches to learning adapted from Hyson (2008).

cognitive, and behavioral skills (Fredricks, Blumenfeld, & Paris, 2004). For example, McClelland, Acock, and Morrison (2006) define ATL as a combination of cognitive self-regulation skills, like strategic planning and focus, and aspects of social competence, (i.e., responsibility, independence, and cooperation.). Similarly Cerda et al. (2014) posit that ATL contains three distinct dimensions—effortful control, behavioral self-regulation, and social competence.

Positive and negative ATL. Other researchers have conceptualized ATL as an *adaptive* response to classroom demands and learning tasks, requiring children to attend and respond to multiple sources of information (Domínguez, Vitiello, Maier, & Greenfield, 2010; Morgan, Farkas, & Qiong Wu, 2009). ATL puts children in greater contact with materials and peers for learning (Halliday, Calkins, & Leerkes, 2018; Vitiello, Greenfield, Munis, & George, 2011). For example, children's increased ability to manage their behavior, inhibit negative emotions, and focus attention in a large group setting helps them to establish a positive relationship with their teachers and classmates and can help as children attempt to problem solve on their own (Neuenschwander et al., 2012). These adaptive behaviors require children to call upon their cognition, motivation, and emotions to ensure their response is in line with contextual expectations (Montroy, Bowles, Skibbe, & Foster, 2014)

As an adaptive response, ATL highlights how a child navigates a new learning environment (Blair, 2002; Ponitz, McClelland, Matthews, & Morrison, 2009). However, some children's learning-related skills are behaviors which escalate conflict and disrupt learning in the classroom (Denham et al., 2012; McClelland et al., 2006). Referred to in the literature as 'negative ATL ,' these behaviors are mal-adaptive and do not promote learning (Montroy et al., 2014). Negative ATL focuses on how children's behavior in the classroom limits their

interactions with teachers or peers (Chen & McNamee, 2011). Children who are in conflict with others or who are disinterested in classroom activities have fewer opportunities to engage in learning tasks (Sabol et al., 2018) Children with negative ATL may be easily distracted, may give up easily, or can be more likely to engage in negative interactions which disturb the learning environment (Montroy et al., 2014).

Negative ATL is associated with more behavioral difficulties, negative teacher-child relationships and poorer academic achievement (Bierman et al., 2009). Problem behaviors appear to interfere not only with classroom learning processes but with the child's own ability to engage in learning (Montroy et al., 2014). In classrooms, children's behavior may be characterized as negative if it is misaligned with the expectations of the setting, e.g. the child blurts out when the expectation is to raise hands or is sent to his seat for touching others during group time. This negative engagement can hinder the development of children's self-regulatory capacity, where lower inhibition (e.g. blurting out) results in reduced attention and a less positive attitude towards learning (Bulotsky-Shearer et al., 2011). Negative ATL may play an increasingly important role as children get older, wherein attention difficulties limit children's ability to engage in learning activities, benefit from instruction, and focus on educational tasks (Domínguez et al., 2010). Academic difficulties, in turn, may eventually lead to increased frustration, lower engagement, and poor self-esteem, in time leading to aggression that will further interfere with learning (Arnold, Kupersmidt, Voegler-Lee, & Marshall, 2012).

However, the relationship between positive and negative approaches is not clear from the literature. While some researchers suggest that the two are distinct constructs, others believe that they may be opposite poles of the same dimension, social competence (Fantuzzo et al., 2007). ATL may mediate the relationship between problem behaviors and academic outcomes (R.

Bulotsky-Shearer et al., 2011). Li-Grinning et al. (2010) found that ATL served a cumulative role in the link between children's behavior problems and academic outcomes. Those with the lowest reported behavior problem benefitted most from higher ATL, which served to widen early gaps in academic competence over time.

Current studies have been limited in their abilities to look at ATL along a continuum, typically evaluating ATL and problem behaviors as separate components of adjustment (Elliott, 2019). Additional research is needed to examine the developmental trajectories of children who exhibit more negative ATL with different patterns of readiness domains (social development, emotional development e.g.) in order to investigate if differences between children persist or fade over time and in what classroom contexts these occur (Abenavoli, Greenberg, & Bierman, 2017). This work may be particularly relevant during the pre-k year, as children's social skills or problem behaviors may account for more of the association between self-regulation and academic growth than in other periods (Montroy et al., 2014).

Approaches to Learning and Other Social-Emotional Constructs

ATL is a global construct that includes components of cognitive, emotional, and social capacities (Daniels, 2014). Although these three components may be distinct on a theoretical level, it is often more difficult to tease them apart empirically. It can be difficult to discern emotional states apart from behavioral manifestations; emotional engagement, for example, may be expressed as enthusiasm or strategic behavior, which looks like approaches learning (Halliday et al., 2018). ATL is sometimes used interchangeably in the literature with executive function, social skills, and emotional regulation. However, ATL is distinct from each of these domains in several ways.

Executive function. Executive function is primarily a cognitive skill that includes the subdomains of working memory, cognitive flexibility or attention shifting, and inhibitory control

(Blair, 2002). ATL shares common terminology with executive function, and the two are sometimes used interchangeably, especially when the construct is measured via attention or attention control (Barbu, Yaden, Levine-Donnerstein, & Marx, 2015). As part of executive function, attention shifting includes the ability to shift between two or more tasks or to move from one activity to the next, while in ATL, attention refers to a child's ability to focus on tasks, resist distractions, and persist (McWayne, Fantuzzo, & McDermott, 2004). Attention, as part of ATL, refers to more proximal processes of observable classroom-based behavior, while attention as part of executive function or effortful control represents more distal or behind-the-scenes cognitive competencies (Barbu et al., 2015). EF typically refers to cognitively-oriented tasks assessed in emotionally neutral contexts, while children may utilize ATL in social situations (Jones, Bailey, Barnes, & Partee, 2016). Conceptually, EF represents neurological brain structures housed in the prefrontal cortex, while ATL represents more behavioral-based (and thus malleable) manifestations of behaviors related to EF (Blair, 2002). Finally, EF is often measured through direct assessment, while ATL is measured via teacher report.

Many studies have suggested that ATL plays a mediational role in the association between EF and academic achievement (Nesbitt, Farran, & Fuhs, 2015; Sasser, Bierman, & Heinrichs, 2015; Vitiello et al., 2011). EF skills, like attention, promote learning-related behaviors, which facilitate academic achievement (Vitiello & Greenfield, 2017). EF allows children the ability to engage and attend, while ATL helps suppress frustration and maintain the goals of the task (Neuenschwander et al., 2012). EF allows the children to focus attention, while ATL represents the behavioral and social manifestations of these skills, such as listening and following directions (McClelland et al., 2007). In the classroom, this looks like a child who is motivated, engaged, and persistent in the face of challenge. In turn, these behaviors allow

children to participate in learning situations and interact and be exposed to classroom instruction, which, in turn, increases academic achievement (Stipek et al., 2010). Said another way, ATL involves the integration of the individual executive functions skills into a contextually appropriate overt response (McClelland et al., 2007; Montroy et al., 2014).

Emotion regulation/effortful control. Both effortful control (EC) and emotional regulation (ER) are associated with ATL. Effortful control, a temperamentally-based predisposition, refers to the ability to inhibit a dominant response and to activate a subdominant one (Zhou, Chen, & Main, 2012). EC helps to regulate children's approach and withdraw tendencies through response management (Rothbart, Posner, & Kieras, 2006). EC allows individuals to modulate their state of arousal and impulsive tendencies, and thus, a measurement of EC may include both impulsivity and emotionality (Cerda et al., 2014). The construct of EC is broader and applicable in more situations outside the classroom, and because it includes a temperament component, EC may be less malleable than ATL (Jones et al., 2016). EC research has focused on how children respond in situations of risk and reward, and thus, may be distinct from ATL in that children may need to approach learning tasks with intrinsic motivation or take risks without fear of reward or punishment (Neuenschwander et al., 2012). Measurement of EC and ATL are both through a teacher or parent report, although EC can also be measured via direct assessment.

Emotion regulation (ER) influences the skills that help children manage, modulate, inhibit, and enhance their emotional arousal in a way that supports adaptive social responses (Williford, Whittaker, Vitiello, & Downer, 2013). Emotion regulation may help children in the classroom to control their emotional response to disappointment when getting a wrong answer, waiting for a toy, or not blurting out an answer. ER is distinct from learning behavior; however,

because the strategy the child selects to successfully manage emotions while playing with peers may not be the same strategy s/he selects to continue learning. In the playground, the child may be able to ignore his/her friend, find new friends, or play alone. In the classroom, the child must redirect frustration or disappointment when working with the teacher in order to maintain a positive relationship (McClelland & Morrison, 2003).

Social development. Preschool learning environments require distinct social and emotional skills (Bulotsky-Shearer et al., 2011). Social skills typically include prosocial behaviors such as sharing, helping others, and expressing concerns for others (Graziano & Hart, 2016). These skills help establish positive, cooperative relationships with peers (Razza, Martin, & Brooks-Gunn, 2015). Social development is centered on children's ability to develop relationships with others; thus, it is distinct from ATL in its focus on successful participation in social as opposed to learning tasks (Cerda et al., 2014).

Bierman et al. (2009) shed light on the distinction between social development and ATL . In their study, they found that children who had a combined profile of aggressive behavior (poor ATL) and prosocial deficits (social skills) showed higher levels of academic knowledge than did children who showed prosocial deficits alone; those with prosocial deficits were learning less because of their disengagement with peers and passivity in the classroom. Aggressive children, on the other hand, were more actively engaged with their teachers and peers, even if negatively so, which helped improve cognitive outcomes. Similarly, a study by Arnold et al. (2012) explored the mediational relationship of both social skills and ATL, finding prosocial behavior demonstrated a small negative relationship with math growth when ATL was also included in the model. These results suggest that ATL and social skills share a significant amount of common variance. This is an important distinction, as most previous studies do not simultaneously include

ATL and measures of social competence. As a result, these studies may have misrepresented the magnitude and perhaps the direction of the relationship between interpersonal skills and achievement.

Behavioral self-regulation. Another term similar to ATL is engagement (Williford et al., 2013). For example, Robinson defined behavioral engagement as a "range of personal actions that exemplify students' approaches to classroom learning including selecting challenging tasks and exerting intense effort and concentration in the implementation of learning tasks in the classroom" (2013, p. 23). Pagani, Fitzpatrick, and Parent's definition of ATL, *classroom engagement*, includes "attentional and emotional regulation, cognitive flexibility, and organization" (2012, p. 717). While cognitive engagement refers more specifically to executive function, behavioral engagement involves sustained participation in learning activities, persistence with schoolwork, and action/effort towards academic endeavors. Daniels (2014) defined engagement as comprised of affective orientations, task focus, persistence in the face of challenge, and interpersonal responsiveness. Finally, Vitiello et al. (2011) defined engagement as a personal initiative, independence, persistence, and self-directed learning. It may be that engagement is a term more commonly used with older children, as it does not always include the social component so prevalent in other definitions of ATL (Robinson, 2013).

ATL is also similar to behavioral self-regulation (BSR), which is a term for cognitively-based functioning under the self-regulation construct (McClelland et al., 2007). In studies, BSR is seen as the behavioral manifestation of executive function (Morrison, Ponitz, & McClelland, 2010). Behavioral self-regulation does not capture the emotional aspects of self-regulation deemed relevant for learning (Ponitz, McClelland, Matthews, & Morrison, 2009). Similar to ATL, BSR is focused on classroom-based behavior but includes more gross motor actions as

opposed to dispositions. ATL is a broader construct than BSR, as it includes planning and self-control as well as social competencies related to responsibility and cooperation (McClelland et al., 2007). BSR is typically measured via behavioral ratings from parents, teachers, and peers, as well as direct observational measures.

In order to understand the multidimensionality of ATL, it is critical to examine how the field has typically defined and measured it and how it is distinct from other forms of self-regulation like executive function, emotion regulation, or behavioral self-regulation (Halliday et al., 2018). While it shares components of social, emotional, and cognitive development, it is distinct from each of these components because it is focused on the children's use of skills in a classroom setting. These studies also suggest that the context in which children develop these skills is important—ATL in a pre-k classroom looks different than ATL in an upper elementary classroom. These different contexts require the child to rely on different components of ATL. Given its multidimensional nature and how ATL has been defined in various fields, it can be difficult to measure ATL accurately. Indeed, many studies have relied on a variety of methods to measure the construct.

One of the limitations of current methodologies is the failure to measure the multi-dimensionality of the construct. Very few studies have examined more than one dimension of ATL, leaving unanswered questions about the degree to social, emotional and cognitive aspects of ATL are interrelated and how they are distinct (Bierman et al., 2009; Ursache et al., 2012). Both ATL and social and emotional adjustment, particularly as children transition into kindergarten represent rich, multidimensional aspects of children's behavioral conduct, yet the shared and independent contributions of dimensions of ATL have not been examined (Baptista, Osório, Martins, Verissimo, & Martins, 2016; Cerda et al., 2014).

Measurement of ATL

Teacher report. ATL has been measured through teacher/parent report and, to a lesser extent, classroom observation. An issue with the teacher/parent report is that the questions included vary from study to study. Many studies utilizing secondary data (i.e., Early Childhood Longitudinal Study—Birth cohort and Families and Child Experiences Survey) have created constructs specifically for their study (Johnson, Finch, & Phillips, 2019; Li-Grining et al., 2010; Razza et al., 2015; Sung & Wickrama, 2018; Youn, 2016). Studies focused on positive child behaviors utilized the Devereux Early Childhood Assessment (Barbu et al., 2015; Tan & Dobbs-Oates, 2013), while other studies employed negative child behavior scales, which were then reverse-scored (Daniels, 2014; Dobbs-Oates & Robinson, 2012; Sasser et al., 2015). Most studies have used the Learning Behavior Scale (LBS) or the Preschool Learning Behaviors Scale (PLBS), which will be described in more detail below.

Although the studies have used different sets of questions, most studies use a combination of questions centered around the social, emotional, and cognitive aspects of ATL. For example, in Elliot's (2019) study, teachers reported on children's behavior by answering seven questions taken from the approach to learning scale from the Social Skills Rating Scale. Sample items included persistence in new tasks, paying attention in class, and adapting to routines. Similarly, Hooper et al. (2010) used teacher ratings to create a composite variable of six questions assessing ATL including eagerness to learn, ability to learn independently, persistence and attention. The longitudinal measure was adapted in third and fifth grade to include a question about following the rules.

Some researchers create their own scale to measure ATL. Neuenschwander et al. (2012) created a scale of ten items derived from previous scales or author's theoretical hypotheses.

Their scale included items measuring persistence, efficiency of homework and self-reliance. In Sasser et al.'s (2015) study, ATL was measured using two scales, classroom participation, and self-regulation/learning motivation. Dominguez et al. (2010) utilized the Galileo System for Electronic Management of Learning, which is a computerized rating scale that teachers complete multiple times throughout the year. Galileo is a rating scale that assesses children's development across a variety of measures. The ATL scale measures initiate and curiosity, learning about objects, engagement and persistence, and goal setting. In this measure, teachers marked a child as "learned/not learned" if they demonstrated the behavior at least three times. While there is a range in study questions and subtypes, the majority of the studies utilize some components of social, emotional, and cognitive domains.

The Preschool Learning Behaviors Scale (PLBS) and the Learning Behavior Scale (LBS), suited for K-3rd grade children, are widely used across many studies and have demonstrated psychometric properties (McWayne et al., 2012; Meng, 2015; Razza et al., 2015). In this 27-item measure, teachers provide ratings from 1-3 with 1) rarely applies to 3) often applies. Most studies that use the PLBS/LBS create a composite measure of all the items as a single ATL score.

Another established measure of ATL is the Learning-to-Learn Scale (LTLS) to measure ATL (Bustamante & Hindman, 2019; Bustamante, White, & Greenfield, 2017; McDermott et al., 2018). LTLS is a 55-item teacher-report measure of children's learning behaviors (McDermott et al., 2011). Teachers indicate whether a given behavior "does not apply," "sometimes applies," or "consistently applies" to each child. Items range from "takes turns when working in a small-group, without needing to be reminded," to "changes strategies when one solution to a problem doesn't work." The measure demonstrates external validity and concurrent validity when

compared with the cognitive subscale scores of the Learning Express, other norm-referenced tests, and teachers' assessments of language and numeracy, in addition to high reliability, $\alpha = .97$ (McDermott et al., 2011).

Observation-based studies. A small number of studies to date have used observational-based measures. Chen and McNamee (2011) used trained assessors to rate children's positive approach to learning across activities, like reading, drawing, playing number games, or puzzles. Their observation-based approach rated children based on their engagement, goal orientation, focus, and planfulness. Halliday et al. (2018) used the PLBS but also used a direct observation measure while children were completing a tangram task. Children were presented with puzzles of increasing difficulty and instructed to ask for help when needed. Children's behavior was then coded on a scale from 1 to 5 (5 being high) based on attention to instructions, on-task behavior, energy, persistence, and monitoring progress. Williford et al. (2013) and Vitiello and Greenfield (2017) used the inCLASS, an observation-based rating of children's engagement in the classroom; this measure rated children's positive engagement with teachers, peers, and tasks. Trained observed watched target children for ten minutes and then rated them based on task, peer, and teacher engagement. Finally, Nesbitt et al. (2015) used the Child Observation Protocol, an observation-based measure designed to quantify behaviors in early childhood classrooms. To measure ATL, Nesbitt et al. (2015) coded children's behavior during specific learning opportunities or social-learning interactions.

Systematic classroom observations may be one way to capture specific learning-related behaviors and overcome the limitations of teacher-reported ratings, which may miss more subtle nondisruptive behaviors (Williford et al., 2013). Classroom observations may also capture behaviors objectively while still allowing the child to be in a more comfortable classroom

setting. Nonetheless, studies employing rigorous observational methods to assess child learning behaviors in the classroom remain limited (Nelson et al., 2017).

Latent profile analysis. Latent profile analysis (LPA) is a statistical technique that has been used to study a variety of early childhood related topics. No studies have been conducted of ATL, per se, but studies have used latent profile analysis to study very similar constructs, for example school readiness, self-control, and emotion regulation. Latent profile analysis is a person-centered approach aiming to identify the dynamics of emerging subgroups in a sample based on a chosen set of variables (Howard & Hoffman, 2018). It has numerous advantages over more traditional variable-centered approaches because it is able to capture heterogeneity in behavior and classify individuals into qualitatively different groups (Racz, O'Brennan, Bradshaw, & Leaf, 2016). This approach can model the stability and change in profile membership that may emerge over the school year, where such changes may have been previously controlled for or overlooked. LPA allows researchers to model and test the joint and nonlinear effects of multiple variables without using higher-order interaction terms (Sabol & Pianta, 2012).

Several large-scale studies have been conducted using LPA to assess children's school readiness (Abenavoli et al., 2017; Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Konold & Pianta, 2005; McWayne, Cheung, Wright, & Hahs-Vaughn, 2012). Abenavoli et al.'s (2017) study measured school readiness using ten teacher-rated scales of cognitive ability, engagement, ATL, emotion regulation, and prosocial behavior, and aggression. Researchers found evidence for four classes of children—well-adjusted, competent aggressive, disengaged, and multi-risk. Two particular subgroups who have mixed patterns of strengths and weaknesses are of interest. Competent aggressive children had higher levels of aggressive behavioral, lower social skills,

and strong academic abilities; thus, these children had strengths in other domains that served to compensate for their lack of social skills to lead to academic outcomes. Academically disengaged children were not aggressive but exhibited low social and academic skills, and potentially can continue to suffer academically because they may go unnoticed because they are not a behavior problem.

McWayne et al. (2012) similarly explored patterns of school readiness, as measured by cognitive and social domains of learning, including cooperative behavior, as rated both by teachers and parents. They found five clusters of children with a range of readiness profiles, including a profile of children who had high social skills and average academics and children who were high across the board. By the end of kindergarten, those who had high social skills made strides in academic achievement comparable with the high academic group.

Two other studies that used person-centered approaches are important to mention. Racz et al. (2016) looked more specifically at classes of disruptive behavior, while Vaughn, DeLisi, Beaver and Wright (2009) measured self-control. Racz et al. (2016) found three distinct profiles which consisted of well-adapted, concentration problems, and children at risk. The discovery of the concentration problems subgroup was unique in that it distinguished children with attention problems from those with disruptive behavior problems. This profile could reflect children who will develop attention problems or children who have difficulty adjusting to the more academic demands of kindergarten. Vaughn et al. (2009) created class profiles parents on parent and teacher reports of self-control across multiple waves of data.

Researchers have completed variable-centered work by exploring patterns of readiness or how skills are configured within individual children and jointly contribute to later school adjustment (Abenavoli et al., 2017). In addition, LPA is a fine-grained analysis which can detect

small subgroups of children who have a mixed pattern of strengths and weaknesses. Latent profile analysis can be especially helpful in classifying children based on multiple variables who may be in need of interventions or additional services, but who may nonetheless fall under clinical levels of problem behaviors.

Indeed, there is "insufficient research…on how to measure this construct efficiently and accurately" (Barbu et al., 2015, p. 1). The above-mentioned studies highlight the multitude of ways that ATL has been conceptualized and measured, each with its benefits. Teacher report helps researchers understand how children are doing globally, while an assessor report provides a snapshot of ATL in a one-on-one setting. It is also important to see what ATL looks like in the context of the classroom when children are utilizing their ATL in different situations and with peers and teachers (Chen & McNamee, 2011). Many of the studies using ATL have utilized a variable-centered approach, which limits the understanding of how school readiness develops across domains (Elliott, 2019). Given that ATL is a complex, multi-dimensional construct, it should be measured in multiple ways and with multiple informants (George & Greenfield, 2005). More research is needed to explore patterns of ATL or how ATL is configured within individual children and how this may relate to later academic outcomes (Abenavoli et al., 2017).

ATL and Academic Outcomes

ATL helps children actively participate in learning situations with teachers and peers and helps maximize children's exposure to classroom instruction (Sasser et al., 2015). It has been associated with achievement in math, reading, science, school readiness, and school adjustment (Bustamante, White, & Greenfield, 2018; Fantuzzo et al., 2004; McClelland et al., 2006; Stipek et al., 2010). As children progress through elementary school, growth in ATL helps support growth in math and literacy (McDermott et al., 2018; Sung & Wickrama, 2018). These effects

are evidenced beyond the effects of children's IQ, previous literacy or math achievement, maternal educational level or executive function (Cerda et al., 2014; Stipek et al., 2010; Sung & Wickrama, 2018).

Much of the research on the relationship between ATL and academic outcomes suggests that it may be particularly beneficial when children are younger (Li-Grining et al., 2010; McClelland et al., 2006). Pre-k or kindergarten ATL is often predictive of academic achievement years later (Fitzpatrick & Pagani, 2013; McDermott et al., 2018). Li-Grinning et al. (2010) suggest that ATL may play a compensatory role in children's academic achievement—children with better ATL experienced greater rates of academic growth, and the differences increased as children went through elementary school; this predictive relationship was strongest in children with lower academic skills at school entry. McClelland et al. (2006) similarly found that children with poor ATL at kindergarten scored significantly lower in both reading in math by 6th grade, although differences were detected by 2nd grade. Razza et al. (2012) found that early academic skills moderated the link between children's ATL at age 5 and their achievement for reading and math at age 9; ATL was most beneficial when children had lower math and reading skills. Children may need to first develop ATL in order to best attend to and engage in math and literacy instruction in kindergarten and later grades (Ansari & Gershoff, 2015).

The Current Study

ATL represents a key school readiness indicator, helping children adapt to their learning environment (Kagan et al., 1995; McClelland & Morrison, 2003). A great deal of research has been conducted to explore ATL as a key school readiness indicator and an important predictor of future academic success; however, more research is needed to understand the developmental roots and sequela of ATL (Sasser et al., 2015). Insufficient research exists on exactly how to

measure this construct efficiently and accurately in a way that is sensitive to individual differences in children's ATL (Barbu et al., 2015; Ponitz et al., 2009). Few studies have examined the detailed classroom contexts in which ATL develops for different children (McDermott et al., 2014; Ponitz et al., 2009). Very little is known about the variation in a child's experience of classroom interactions over time (Bohlmann et al., 2019; Chang et al., 2007). A more fine-grained analysis of children's individual experiences may be able to capture the ways in which children's specific social and emotional skills help them to navigate each type of preschool learning activity or social interaction (Kontos & Keyes, 1999). This can shed light on how children's positive or negative engagement has been associated with various academic outcomes (Domínguez, Vitiello, Fuccillo, Greenfield, & Bulotsky-Shearer, 2011).

Given the limitations of the previous literature, the aim of this study is to create a conceptualization of ATL that considers the multi-dimensional nature of the construct. This study will provide clarity about the components of ATL, given the multitude of definitions and lack of a comprehensive list (Chen & McNamee, 2011; Domínguez et al., 2010). In addition, person-centered analysis will explore how children's individual characteristics contribute to the expression of ATL in the classroom. This analysis can potentially bring forward different groups of students along a continuum of learning approaches (Collie, Martin, Nassar, & Roberts, 2019). Further understanding of how these groups differ in their academic competencies can help researchers understand the foundational nature of ATL. The research questions for this study include 1) are there three distinct dimensions (social, emotional, and cognitive) of ATL conceptually and empirically? How is this model of ATL distinct from other constructs like executive function? 2) can different types of ATL be empirically distinguished? 3) are there profiles which include both positive and negative approaches to learning? In what ways do

profiles change after including negative approaches to learning? 4) how do these different profiles of approaches to learning predict academic outcomes?

Methods

Data Source

This study will utilize data from a larger study exploring child, family, and classroom characteristics of a Head Start program, the Preschool Child Assessment Survey (PCAS). PCAS is a series of longitudinal data collection aimed at understanding the experiences of children and families in a local Head Start program. This study uses a multi-stage sampling approach. First, classrooms were randomly chosen from the list of possible Head Start classrooms, with each classroom having an equal probability of selection. Then, six children were selected from each classroom, stratified by gender and home language to match program enrollment.

Table 1 provides a study timeline. Children in this sample were assessed at two time points, the fall and spring of their Head Start year. Classroom observations were conducted in the winter (see Table 1). Multiple methods were used to collect a rich array of information about children and families including direct child assessments, classroom observations, and teacher reports. Additional demographic information for the children was collected using program administrative records.

Table 1

Data Collection Timeline

Data Collection	**Fall**	**Winter**	**Spring**
Assessments	DECA Leiter Woodcock-Johnson BRACKEN Task-Based EF measures	inCLASS	DECA Leiter Woodcock-Johnson BRACKEN Task-Based EF measures

Participants

Participants for this study included children (n = 268) who were enrolled in 61 classrooms from 1 Head Start program in a medium-sized city in the United States. Given that the children qualify for Head Start, the vast majority of the sample was low income. Recruitment of the identified children occurred when research assistants approached the child's parent or guardian before or after school to discuss the study and secured informed consent. Each child assent to participate was monitored during the assessments by the trained assessors; children who became upset or refuse to answer questions were returned to their classrooms. Two additional attempts, on different days, were made to assess children who had previously refused to participate.

Participants ranged in age from 28 to 59 months, although for this study, the 268 children who are either 3 (135) or 4 (133) will be used. The majority of participants Hispanic (35%) or Black/African American (25%) or white (19%). There were slightly more boys than girls in the sample (female=43%). Most participants (58.3%) home language was English, while 36.8% of participants' home language was Spanish.

Measures

Approaches to Learning. Children's ATL will be measured through multiple informants and methods--classroom-based observation, teacher report, and assessor report. These varied approaches will provide a range of information about children's ATL.

Individual Classroom Assessment Scoring System (inCLASS; Downer et al., 2010). The Individual Classroom Assessment Scoring System (inCLASS) is a child-focused observational assessment of children's positive and active engagement with teachers, peer, and

tasks in preschool (Downer et al., 2010). During an observation cycle, the target child is observed for ten minutes and then rated along ten dimensions on a seven-point scale from one (low) to seven (high) (Yoder, Williford, & Vitiello, 2019). Summary scores for each domain are created by averaging items within a domain. Ratings incorporate both the quality and the frequency of the behaviors. The inCLASS also has checklists to record setting-related factors that occur during observation cycles. These include whether the teacher was present, activity settings (large group, small group, free choice, meals, etc.) and whether the teacher was directing the activity.

The inCLASS includes ten dimensions across three domains (teacher interactions, peer interactions, and task orientation). For this study, the domain of task orientation will be explored. This includes three dimensions—engagement within tasks, self-reliance and behavioral control. Engagement within tasks is a measure of the degree to which a child is consistently and actively involved in classroom tasks. Self-reliance measures the degree to which a child takes learning into their own hands, which includes things like opportunity seeking and resource utilization. Finally, behavior control measures the degree to which the child regulates their movements and speech to match the setting. In addition, the domain "conflict interactions" will be used. This domain includes both peer conflict and measures the degree to which children's interactions are characterized by tension, resistance, and negativity. Confirmatory factor analysis from both the inCLASS pilot and field study indicated that these two dimensions loaded separately onto the conflict interaction domain (University of Virginia CASTL, 2012).

Several studies have researched the psychometric properties of the inCLASS. For example, Downer et al. (2010) found support for concurrent validity when the positive engagement with teachers inCLASS dimension was positively related to ratings of teacher-child

closeness and child assertiveness. The inCLASS has also shown construct and criterion validity specific to both positive and negative peer engagement, with studies identifying mild or moderate associations between the inCLASS peer dimensions and teacher-rated social skills on measures such as the Teacher-Child Rating Scale (Downer et al., 2010). The inCLASS also has demonstrated discriminant validity, as the teacher interaction domain was largely unrelated to any task-peer and conflict focused rating scales (Downer et al., 2010; Williford et al., 2013) The inCLASS was able to maintain measurement properties across demographic groups including poverty status, ethnicity, and gender (Bohlmann et al., 2019). It has also been associated with measures of school readiness and self-regulation, indicating that the inCLASS is able to capture behaviors relevant to the learning process (Sabol et al., 2018). ***Devereux Early Childhood Assessment, Preschool 2nd edition (DECA-2P; LeBuffe & Naglieri, 1999).*** The DECA is a standardized, norm-referenced rating scale used to assess the behavior and functioning of children aged 2 to 5 (LeBuffe & Shapiro, 2004). The DECA is a strength-based instrument that helps teachers and parents understand the nature of a child's social, emotional, and behavioral functioning (Crane, Mincic, & Winsler, 2011). In particular, the DECA was designed to help identify children's strengths and resilience, compared to other measures emphasizing children's pathology (LeBuffe & Naglieri, 1999).

Caregivers rate children on a 5-point scale according to how often (never, rarely, occasionally, frequently, very frequently) behavior has been observed within the last four months. These ratings produce two different scores: behavioral concerns (10 items) and total protective factors (27 items). Factor analysis across multiple studies (Crane et al., 2011; LeBuffe & Shapiro, 2004) has shown the protective items load onto three factors. These include initiative, the child's ability to use independent thought and action to meet his/her needs; self-control, the

child's ability to experience a range of feelings and express them; and attachment, a measure of the mutual, strong and long-lasting relationship between the child and a significant adult. For this study, initiative and self-control will be explored as well as the behavioral concerns (all items).

The DECA has demonstrated acceptable psychometric properties. For example, to establish criterion validity, the authors conducted a study of the predictive validity of the DECA to correctly identify children as part of a clinical or matched non-referred sample; the total protective factors were able to correctly classify 69% of the children. Lien and Carlson (2009) provided evidence that the internal consistency and standard error of measurement values on the DECA for a Head Start sample that closely mirrored those of the standardization sample, indicating that the measure was reliable with Head Start populations. Similarly, Crane et al. (2011) demonstrated that the measure had internal consistency within a low-income and ethnically diverse sample and that there were no differences in internal consistency between the Spanish and English versions of the DECA. A study by LeBuffe and Shapiro (2004) provided evidence that the DECA was able to discriminate between groups of preschoolers with and without emotional difficulties and was able to predict behavioral concerns.

Leiter-3 Examiner Rating Scale (Roid & Miller, 1997). The Leiter-R is a behavior rating scale that is completed by the assessors after a testing session. The assessor is asked to rate children's behavior from 0 (rarely) to 3 (always). Children are rated according on eight subscales: attention, organization, activity level, sociability, energy/feelings, regulation and mood regulation, anxiety, and sensitivity reactivity. After scoring, the attention, organization, activity and sociability scores are combined to create a cognitive/social composite score, and the energy, regulation, anxiety and sensory reaction scores are added to create an emotion regulation composite score. For this study, the items in the cognitive/social composite will be utilized. This

includes examples such as the child pays attention, persists (attention), thinks and plans before beginning, independently begins tasks (organization), remains in seat appropriately during test, maintains activity level (activity level), interacts positively, alert (sociability), and positive statements regarding performance, confident (energy/feelings).

Task-based executive function. Children's EF will be measured using three direct assessments: the Pencil Tap, Digit Span, and the Head Toes Knees and Shoulders. These three measures are thought to capture the multiple components of executive function—inhibitory control, working memory, and cognitive flexibility. As a measure of inhibitory control, the Pencil Tap is a simple yet objective assessment of the child's ability to suppress the urge to copy the assessor (Blair & Razza, 2007; McClelland et al., 2007). Both the child and the assessor have a pencil; if the assessor taps twice, the child is instructed to tap once and vice versa. Children are given three practice trials, and, upon succeeding, are administered sixteen additional trials. Each correct trial is scored a one, such that scores range from 0 to 16. This measure is a widely used measure of EF, particularly for younger children (Fuhs, Farran, & Nesbitt, 2015; B. Hamre, Hatfield, Pianta, & Jamil, 2014; Smith-Donald, Raver, Hayes, & Richardson, 2007; Weiland, Barata, & Yoshikawa, 2014)

The Digit Span task is an assessment of children's working memory (Gathercole & Pickering, 2000). In this task, children are told a string of numbers and are asked to repeat the numbers back to the assessor in the correct order. Across trials, the number stems get increasingly longer. Similar to the Pencil Tap, children are given two practice items, and then trials begin with the first 2-digit number sequence. The trials stop when the child incorrectly repeats two different sequences of the same length. Children receive one point for each correct answer, resulting in a range of possible scores from 0-11. The Digit Span has been utilized in

several studies with young children and represents a valid measure of working memory (Bull, Espy, & Senn, 2004; Mahy & Moses, 2011; Williford et al., 2013)**.**

The Head Toes Knees Shoulders task (HTKS) is a measure of children's overall behavioral control, including their cognitive flexibility and working memory (McClelland et al., 2014). The task is appropriate for children from 4 to 8 years old and relies on verbal instructions from the assessor. During the initial phase of the task, children are directed to respond naturally to the directions, i.e., touch your toes would indicate touch your toes. During the next phase, children are instructed to do the opposite—if they are instructed to touch their heads, then they touch their toes. During the final phase, the pairings are switched again. This time, the head goes with the knees. Children only move to the next phase after correctly answering in the previous phase, until they have reached thirty trials. Children receive a score of two per trial if they answer correctly and a one if they answer incorrectly at first but then self-correct. Thus, the possible scores will range from 0 to 60. The HTKS has been used as a measure of executive function in several studies of young children (McClelland & Cameron, 2012; Ponitz et al., 2009; Wanless, McClelland, Tominey, & Acock, 2011). Additionally, the task demonstrates strong interrater reliability and construct and predictive validity (Ponitz et al., 2009).

Academic Outcomes. Children's math outcomes were measured directly, using two direct assessments—the Woodcock-Johnson and the Bracken School Readiness Assessment**.** These separate measurements provide a wider picture of children's academic outcomes.

Woodcock-Johnson Applied Problems (Mather, 2001). The Woodcock-Johnson is a nationally normed assessment of math (Woodcock, Mcgrew, & Mather, 2001). The applied problems portion of the assessment will be used, which measures children's ability to solve oral problems, including counting pictured objects and simple story problems (e.g., "Show me two

fingers," "How many ducks are in the water?"). In this assessment, children answer questions by looking at pictures presented using a testing flipbook, proceeding through the items until they have reached the ceiling pre-established by the testing manual. This measure has been used in numerous studies to measure math achievement and has an average Cronbach's α for preschool-age children of. 91 (Rhoades, Warren, Domitrovich, & Greenberg, 2011). In the current study, the total standardized score, which accounts for the child's age, will be used. The subtest's internal reliability is 0.92 for 3-year-old children and 0.94 for 4-year-old children for the WJ III and 0.93 for 4-year-old children for the WM III (Woodcock et al., 2001)

***Bracken School Readiness Assessment (BSRA; Bracken, 2007*).** The Bracken School Readiness Assessment consists of 88 items aimed to measure children's school readiness (Panter & Bracken, 2009). Using a flipbook with visual supports, children are assessed over colors, letters, numbers, sizes, comparisons, and shapes. The assessment takes approximately 15 minutes to administer. Each of the scores from the subtest is summed to provide a raw score, which then is converted to a scaled score based on the child's age. The Bracken has been normed on a sample of children ranging from 2 to 8 years old (Bracken, 2007). The Bracken has also been used as a measure of school readiness in several studies with young children (Caughy & Owen, 2015; Graziano, Slavec, Hart, Garcia, & Pelham, 2014; Wilson, 2004)

Procedures

Training. All assessments were administered by trained assessors. Prior to data collection, assessors were provided with extensive training on each of the child assessment measures (Woodock-Johnson, Bracken, task-based EF measures). During this training, assessors reviewed manuals and conducted practice assessments Assessors met reliability criteria established by the research team or by the authors of various measures and were then certified by

the PCAS training coordinator prior to administering assessment to study children. Similarly, for the classroom observations, assessors were attended two days of training on the inCLASS, where they watched videos, practiced coding using the inCLASS manual, and discussed results. Assessors then independently coded video clips and had to score within 1 point of a master coder on 80% of scoring to be deemed reliable and ready for data collection.

Data collection. As noted in Table 1, child assessments were conducted during the fall and spring. Research teams of three to four assessors were assigned to a school site to conduct the child assessments. Children were assessed one-on-one with a trained assessor in an isolated area of the Head Start classroom or hallway. Child assessments were conducted over two mornings, with the task-based EF measures conducted on one day and the academic assessments conducted on the following day, with each assessment period lasting approximately 30 minutes. Immediately following the second day of assessment, the assessor completed the Leiter-R assessment on the child. While assessors were on-site conducting assessments, they collected the teacher-reported measures.

For the classroom-based observations, a research team member was assigned to a participating classroom to conduct observations, which lasted approximately four hours. Each child in the study was observed for approximately ten minutes, following by five minutes of scoring. Observations continued throughout the day, until naptime in order to obtain as many cycles per study child as possible (mean cycles = 3.67).

Data Entry. Immediately following child assessments or observations, assessors entered data into an Excel spreadsheet, where the child was assigned an ID, and the data was de-identified. Then, the excel spreadsheet was converted to SPSS for analysis.

Plan of Analysis

All data will be analyzed using SPSS and Stata. SPSS will be used for descriptive analysis (means and standard deviations) and to check the characteristics of the data to determine if assumptions for various analyses are met. An analysis of missing data will also be conducted in order to determine how missing data will be handled.

A table summarizing the research questions, instruments and data analysis techniques is listed in Table 2.

Table 2.

Research Questions and Data Analysis Techniques

Research Question	**Data Source**	**Data Analysis Technique**
Are there three distinct dimensions (social, emotional, and cognitive) of ATL conceptually and empirically? How is this model of ATL distinct from other constructs like executive function?	DECA Leiter InCLASS Task-based EF measures	Confirmatory Factor Analysis --Do the assessment level items load onto the latent constructs (social, emotional, and cognitive) --Do the three latent constructs load onto an approaches to learning latent construct?
Can different types of approaches to learning be empirically distinguished?	DECA Leiter InCLASS	Latent Profile Analysis—using items from DECA, Leiter and inCLASS
Are there profiles which include both positive and negative approaches to learning? In what ways do profiles change when considering negative approaches to learning?	DECA—behavior problems subscale InCLASS—teacher and peer conflict domains	Latent Profile Analysis which incorporates both positive and negative ATL

How do these different profiles of approaches to learning predict academic outcomes?	DECA Leiter InCLASS	Regression Model where latent class is a categorical variable and is used along with co-variates to test the association between the latent class and math outcomes

In order to answer RQ1 (what does ATL look like across various measurements), confirmatory factor analysis (CFA) will be used. First, item-level analysis will be done to test whether questionnaire items load onto three latent constructs—social, cognitive, and emotional components of ATL (see Figure 3). Next, CFA will be employed to test whether these constructs load onto an ATL latent construct. Model fit indices and factor loadings will be used to determine the strength of the model. An additional measurement model will be used where the task-based EF measures are loaded onto the latent variables (cognitive, social, and emotional) as well as separately (into a latent EF construct) to compare model fits. This will also ensure that the ATL construct is measuring ATL and not EF.

In order to answer RQ2 (can different types of ATL be empirically distinguished), latent profile analysis (LPA) will be used. LPA us a form of mixture modeling in which continuous observed variables are represented by latent categorical variables such that patterns of empirically-derived dimensions within children (Muthen, 2001). Before estimating the models, all variables included will be standardized such that profile means represent differences from the sample in standard deviation units and aid in interpretation. Then, a series of LPA models of ATL will be examined based on the eight measures of ATL. Model estimation will begin with a 1-class solution and add an additional class in each successive model until a model has been reached that is guided by both fit statistics and conceptual interpretability. Model fit will be

estimated using various fit statistics (e.g., Akaike Information Criteria, Bayesain Information Criteria). Finally, in order to better understand the profile membership, a final step will be to test between-profile difference on demographic characteristics (sex, age). Using Mplus, LPA models will be estimated using sandwich estimators to adjust the standard errors of the parameters, as is necessary within a multilevel framework (Muthén, 1989). The group assignment for each child will be saved to the data file as a categorical variable.

In order to answer RQ3, (the relationship between positive and negative ATL), latent profile analysis will be employed using a process similar to what is described above. However, in order to understand the relationship between children's ATL and problem behaviors, additional variables will be entered into the equation (DECA behavior problems and inCLASS teacher and peer conflict) that account for children's negative ATL. Profile membership will be compared across both models in order to see whether the additional measures provide a better model fit and whether class membership changes.

In order to answer RQ4 (does profile membership predict academic outcomes), multilevel regression models will be conducted that take into account children's profile membership. First, children's profile type will be dummy coded so that the child will receive a code of 1 for classification in one profile type. These profiles, which represent children's ATL, will be entered as predictors, along with demographic covariates and fall academic scores in a regression equation predicting children's spring academic outcomes.

Potential Limitations

This study has a few limitations that may limit the generalizability of the findings. First, data were collected from one Head Start program, thus may not be representative of other Head

Start programs across the country. Secondly, the math measures, although robust, may not provide the most accurate picture of children's math achievement. For example, other measure measures (Test of Early Math Ability, Early Childhood Assessment in Mathematics) may highlight other dimensions of children's math development, including their geometry and numeracy skills, better than the Woodcock Johnson or Bracken alone. Finally, this study represents children in the pre-k year. The results of this study could be strengthened if children's ATL and problem behaviors were assessed as they transition into kindergarten and beyond. Despite these limitations, this study has the potential to highlight the varied constructs of approaches to learning and the relationship between this variability and children's academic outcomes. Using both positive and negative approaches can highlight a wide variety of children's patterns of behaviors. This can be helpful in designing targeted interventions or informing classroom practices.

References

Abenavoli, R. M., Greenberg, M. T., & Bierman, K. L. (2017). Identification and validation of school readiness profiles among high-risk kindergartners. *Early Childhood Research Quarterly, 38*, 33–43. https://doi.org/10.1016/j.ecresq.2016.09.001

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), 1–157.

Ansari, A., & Gershoff, E. (2015). Learning-related social skills as a mediator between teacher instruction and child achievement in Head Start: Learning-related social skills and teacher instruction. *Social Development*, *24*(4), 699–715. https://doi.org/10.1111/sode.12124

Arnold, D. H., Kupersmidt, J. B., Voegler-Lee, M. E., & Marshall, N. A. (2012). The association between preschool children's social functioning and their emergent academic skills. *Early Childhood Research Quarterly*, *27*(3), 376–386. https://doi.org/10.1016/j.ecresq.2011.12.009

Bailey, C. S., Denham, S. A., Curby, T. W., & Bassett, H. H. (2016). Emotional and organizational supports for preschoolers' emotion regulation: Relations with school adjustment. *Emotion, 16*(2), 263–279. https://doi.org/10.1037/a0039772

Baptista, J., Osório, A., Martins, E. C., Verissimo, M., & Martins, C. (2016). Does social–behavioral adjustment mediate the relation between executive function and academic readiness? *Journal of Applied Developmental Psychology*, *46*, 22–30. https://doi.org/10.1016/j.appdev.2016.05.004

Barbu, O. C., Yaden, D. B., Levine-Donnerstein, D., & Marx, R. W. (2015). Assessing approaches to learning in school readiness: Comparing the Devereux Early Childhood Assessment to an early learning standards-based measure. *AERA Open*, *1*(3). https://doi.org/10.1177/2332858415593923

Bierman, K. L., Torres, M. M., Domitrovich, C. E., Welsh, J. A., & Gest, S. D. (2009). Behavioral and cognitive readiness for school: Cross-domain associations for children attending head start. *Social Development, 18*(2), 305–323. https://doi.org/10.1111/j.1467-9507.2008.00490.x

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. https://doi.org/10.1037//0003-066X.57.2.111

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*(2), 647–663. https://doi.org/10.1111/j.1467-8624.2007.01019.x

Bohlmann, N. L., Downer, J. T., Williford, A. P., Maier, M. F., Booren, L. M., & Howes, C. (2019). Observing children's engagement: Examining factorial validity of the inCLASS across demographic groups. *Journal of Applied Developmental Psychology, 60*, 166–176. https://doi.org/10.1016/j.appdev.2018.08.007

Booren, L. M., Downer, J. T., & Vitiello, V. E. (2012). Observations of children's interactions with teachers, peers, and tasks across preschool classroom activity settings. *Early Education and Development, 23*(4), 517–538. https://doi.org/10.1080/10409289.2010.548767

Bracken, B. A. (2007). *Bracken basic concept scale-revised.* (3rd ed.). San Antonio, TX: Psychological Corporation.

Bronfenbrenner, U. (2005). Ecological systems theory (1992). In *Making human beings human: Bioecological perspectives on human development* (pp. 106–173). Thousand Oaks, CA: Sage Publications Ltd.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In *Handbook of child psychology: Theoretical models of human development, Volume 1, 5th ed* (pp. 993–1028). Hoboken, NJ, US: John Wiley & Sons Inc.

Bull, R., Espy, K. A., & Senn, T. E. (2004). A comparison of performance on the Towers of London and Hanoi in young children. *Journal of Child Psychology and Psychiatry, 45*(4), 743–754. https://doi.org/10.1111/j.1469-7610.2004.00268.x

Bulotsky-Shearer, R., Dominguez, X., & Bell, E. R. (2012). Preschool classroom behavioral context and school readiness outcomes for low-income children: A multilevel examination of child- and classroom-level influences. *Journal of Educational Psychology*, *104*(2), 421–438. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0026301

Bulotsky-Shearer, R., Fernandez, V., Dominguez, X., & Rouse, H. L. (2011). Behavioral problems in learning activities and social interaction in Head Start classrooms and early reading math and approaches to learning. *School Psychology Review*, *40*(1), 39–56.

Bulotsky-Shearer, R. J., Bell, E. R., & Domínguez, X. (2012). Latent profiles of problem behavior within learning, peer, and teacher contexts: Identifying subgroups of children at academic risk across the preschool year. *Journal of School Psychology*, *50*(6), 775–798. https://doi.org/10.1016/j.jsp.2012.08.001

Bustamante, A. S., & Hindman, A. H. (2019). Classroom quality and academic school readiness outcomes in Head Start: The indirect effect of approaches to learning. *Early Education and Development, 30*(1), 19–35. https://doi.org/10.1080/10409289.2018.1540249

Bustamante, A. S., White, L. J., & Greenfield, D. B. (2017). Approaches to learning and school readiness in Head Start: Applications to preschool science. *Learning and Individual Differences, 56,* 112–118. https://doi.org/10.1016/j.lindif.2016.10.012

Bustamante, A. S., White, L. J., & Greenfield, D. B. (2018). Approaches to learning and science education in Head Start: Examining bidirectionality. *Early Childhood Research Quarterly*, *44*, 34–42. https://doi.org/10.1016/j.ecresq.2018.02.013

Caughy, M. O., & Owen, M. T. (2015). Cultural socialization and school readiness of African American and Latino preschoolers. *Cultural Diversity & Ethnic Minority Psychology*, *21*(3), 391–399. https://doi.org/10.1037/a0037928

Cerda, C. A., Im, M. H., & Hughes, J. N. (2014). Learning-related skills and academic achievement in academically at-risk first graders. *Journal of Applied Developmental Psychology*, *35*(5), 433–443. https://doi.org/10.1016/j.appdev.2014.08.001

Chang, F., Crawford, G., Early, D., Bryant, D., Howes, C., Burchinal, M., … Pianta, R. (2007). Spanish-speaking children's social and language development in pre-kindergarten classrooms. *Early Education and Development*, *18*(2), 243–269. https://doi.org/10.1080/10409280701282959

Chen, J.-Q., & McNamee, G. D. (2011). Positive approaches to learning in the context of preschool classroom activities. *Early Childhood Education Journal*, *39*(1), 71–78. https://doi.org/10.1007/s10643-010-0441-x

Collie, R. J., Martin, A. J., Nassar, N., & Roberts, C. L. (2019). Social and emotional behavioral profiles in kindergarten: A population-based latent profile analysis of links to socio-educational characteristics and later achievement. *Journal of Educational Psychology*, *111*(1), 170–187. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/edu0000262

Crane, J., Mincic, M. S., & Winsler, A. (2011). Parent–teacher agreement and reliability on the Devereux Early Childhood Assessment (DECA) in English and Spanish for ethnically diverse children living in poverty. *Early Education and Development*, *22*(3), 520–547. https://doi.org/10.1080/10409289.2011.565722

Daniels, D. H. (2014). Children's affective orientations in preschool and their initial adjustment to kindergarten: Children's affective orientations in preschool. *Psychology in the Schools*, *51*(3), 256–272. https://doi.org/10.1002/pits.21748

Degnan, K. A., Calkins, S. D., Keane, S. P., & Hill-Soderlund, A. L. (2008). Profiles of disruptive behavior across early childhood: Contributions of frustration reactivity, physiological regulation, and maternal behavior. *Child Development*, *79*(5), 1357–1376. https://doi.org/10.1111/j.1467-8624.2008.01193.x

Denham, S., Bassett, H. H., Mincic, M., Kalb, S., Way, E., Wyatt, T., & Segal, Y. (2012). Social-emotional learning profiles of preschoolers' early school success: A person-centered approach. *Learning and Individual Differences*, *22*(2), 178–189. https://doi.org/10.1016/j.lindif.2011.05.001

Denham, S., & Brown, C. (2010). “Plays nice with others”: Social–emotional learning and academic success. *Early Education & Development*, *21*(5), 652–680. https://doi.org/10.1080/10409289.2010.497450

Dobbs-Oates, J., & Robinson, C. (2012). Preschoolers’ mathematics skills and behavior: Analysis of a national sample. *School Psychology Review*, *41*(4), 371–386.

Domínguez, X., Vitiello, V. E., Fuccillo, J. M., Greenfield, D. B., & Bulotsky-Shearer, R. J. (2011). The role of context in preschool learning: A multilevel examination of the contribution of context-specific problem behaviors and classroom process quality to low-income children’s approaches to learning. *Journal of School Psychology*, *49*(2), 175–195. https://doi.org/10.1016/j.jsp.2010.11.002

Domínguez, X., Vitiello, V. E., Maier, M. F., & Greenfield, D. B. (2010). A longitudinal examination of young children’s learning behavior: Child-level and classroom-level predictors of change throughout the preschool year. *School Psychology Review*, *39*(1), 29.

Downer, J. T., Booren, L. M., Lima, O. K., Luckner, A. E., & Pianta, R. C. (2010a). The Individualized Classroom Assessment Scoring System (inCLASS): Preliminary reliability and validity of a system for observing preschoolers’ competence in classroom interactions. *Early Childhood Research Quarterly*, *25*(1), 1–16. https://doi.org/10.1016/j.ecresq.2009.08.004

Downer, J. T., Booren, L. M., Lima, O. K., Luckner, A. E., & Pianta, R. C. (2010b). The Individualized Classroom Assessment Scoring System (inCLASS): Preliminary reliability and validity of a system for observing preschoolers’ competence in classroom interactions. *Early Childhood Research Quarterly*, *25*(1), 1–16. https://doi.org/10.1016/j.ecresq.2009.08.004

Elliott, L. (2019). Profiles of academic, cognitive, and behavioral development from kindergarten to third grade. *Learning and Individual Differences*, *70*, 109–120. https://doi.org/10.1016/j.lindif.2019.01.010

Fantuzzo, J., Bulotsky-Shearer, R., Fusco, R. A., & McWayne, C. (2005). An investigation of preschool classroom behavioral adjustment problems and social–emotional school readiness competencies. *Early Childhood Research Quarterly*, *20*(3), 259–275. https://doi.org/10.1016/j.ecresq.2005.07.001

Fantuzzo, J., Bulotsky-Shearer, R., McDermott, P., McWayne, C., Frye, D., & Perlman, S. (2007). Investigation of dimensions of social-emotional classroom behavior and school readiness for low-income urban preschool children. *Social Psychology Review*, *36*(1), 44–62.

Fantuzzo, J., Perry, M. A., & McDermott, P. (2004). Preschool approaches to learning and their relationship to other relevant classroom competencies for low-income children. *School Psychology Quarterly*, *19*(3), 212–230. https://doi.org/10.1521/scpq.19.3.212.40276

Fitzpatrick, C., & Pagani, L. S. (2013). Task-oriented kindergarten behavior pays off in later childhood. *Journal of Developmental & Behavioral Pediatrics*, *34*(2), 94–101. https://doi.org/10.1097/DBP.0b013e31827a3779

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Fuhs, M., Farran, D. C., & Nesbitt, K. T. (2015). Prekindergarten children's executive functioning skills and achievement gains: The utility of direct assessments and teacher ratings. *Journal of Educational Psychology*, *107*(1), 207–221. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0037366

Gathercole, S. E., & Pickering, S. J. (2000). Working memory deficits in children with low achievements in the national curriculum at 7 years of age. *British Journal of Educational Psychology*, *70*(2), 177–194. https://doi.org/10.1348/000709900158047

George, J., & Greenfield, D. B. (2005). Examination of a structured problem-solving flexibility task for assessing approaches to learning in young children: Relation to teacher ratings and children's achievement. *Journal of Applied Developmental Psychology*, *26*(1), 69–84. https://doi.org/10.1016/j.appdev.2004.10.006

Graziano, P. A., & Hart, K. (2016). Beyond behavior modification: Benefits of social–emotional/self-regulation training for preschoolers with behavior problems. *Journal of School Psychology*, *58*, 91–111. https://doi.org/10.1016/j.jsp.2016.07.004

Graziano, P. A., Slavec, J., Hart, K., Garcia, A., & Pelham, W. E. (2014). Improving school readiness in preschoolers with behavior problems: Results from a summer treatment program. *Journal of Psychopathology and Behavioral Assessment*, *36*(4), 555–569. https://doi.org/10.1007/s10862-014-9418-1

Hair, E., Halle, T., Terry-Humen, E., Lavelle, B., & Calkins, J. (2006). Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade. *Early Childhood Research Quarterly*, *21*(4), 431–454. https://doi.org/10.1016/j.ecresq.2006.09.005

Halliday, S. E., Calkins, S. D., & Leerkes, E. M. (2018). Measuring preschool learning engagement in the laboratory. *Journal of Experimental Child Psychology*, *167*, 93–116. https://doi.org/10.1016/j.jecp.2017.10.006

Hamre, B., Hatfield, B., Pianta, R., & Jamil, F. (2014). Evidence for general and domain-specific elements of teacher–child interactions: Associations with preschool children's development. *Child Development*, *85*(3), 1257–1274. https://doi.org/10.1111/cdev.12184

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. https://doi.org/10.1111/1467-8624.00301

Hooper, S. R., Roberts, J., Sideris, J., Burchinal, M., & Zeisel, S. (2010). Longitudinal predictors of reading and math trajectories through middle school for African American versus Caucasian students across two samples. *Developmental Psychology*, *46*(5), 1018–1029. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0018877

Howard, M. C., & Hoffman, M. E. (2018). Variable-Centered, Person-Centered, and Person-Specific Approaches: Where Theory Meets the Method. *Organizational Research Methods*, *21*(4), 846–876. https://doi.org/10.1177/1094428117744021

Hunt, J. B., Carolina, N., Engler, J., Graves, W., Patton, P. E., Romer, R., … Riley, R. W. (1998). National Education Goals Panel. *Ready Schools*, 40.

Hyson, M. (2008). *Enthusiastic and engaged learners*. New York, NY: Teachers College Press.

Johnson, A. D., Finch, J. E., & Phillips, D. A. (2019). Associations between publicly funded preschool and low-income children's kindergarten readiness: The moderating role of child temperament. *Developmental Psychology*, *55*(3), 623–636. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/dev0000651

Jones, S. M., Bailey, R., Barnes, S. P., & Partee, A. (2016). *Executive function mapping project: Untangling the terms and skills related to executive function and self-regulation in early childhood* (No. OPRE Report # 2016-88). Washington, DC: Office of Planning, Research and Evaluation.

Kagan, S., Moore, E., & Bredekamp, S. (1995). *Reconsidering children's early learning and development: Toward common views and vocabulary*. Washington, DC: National Education Goals Panel.

Konold, T. R., & Pianta, R. C. (2005). Empirically-derived, person-oriented patterns of school readiness in typically-developing children: Description and prediction to first-grade achievement. *Applied Developmental Science*, *9*(4), 174–187. https://doi.org/10.1207/s1532480xads0904_1

Kontos, S., & Keyes, L. (1999). An ecobehavioral analysis of early childhood classrooms. *Early Childhood Research Quarterly*, *14*(1), 35–50. https://doi.org/10.1016/S0885-2006(99)80003-9

Ladd, G. W., & Burgess, K. B. (2001). Do relational risks and protective factors moderate the linkages between childhood aggression and early psychological and school adjustment? *Child Development, 72*(5), 1579–1601. Retrieved from JSTOR.

LeBuffe, P., & Naglieri, J. (1999). *The Devereux Early Childhood Assessment*. Lewisville, NC: Kaplan Press Publishing.

LeBuffe, P., & Shapiro, V. (2004). Lending "strength" to the assessment of preschool social-emotional health. *The California School Psychologist, 9*, 51–61.

Lien, M. T., & Carlson, J. S. (2009). Psychometric properties of the Devereux Early Childhood Assessment in a Head Start sample. *Journal of Psychoeducational Assessment, 27*(5), 386–396. https://doi.org/10.1177/0734282909331754

Li-Grining, C. P., Votruba-Drzal, E., Maldonado-Carreno, C., & Haas, K. (2010). Children's early approaches to learning and academic trajectories through fifth grade. *Developmental Psychology, 46*(5), 1062–1077. https://doi.org/10.1037/a0020066

Lutz, M. N., Fantuzzo, J., & McDermott, P. (2002). Multidimensional assessment of emotional and behavioral adjustment problems of low-income preschool children: Development and initial validation. *Early Childhood Research Quarterly, 17*(3), 338–355. https://doi.org/10.1016/S0885-2006(02)00168-0

Mahy, C. E. V., & Moses, L. J. (2011). Executive functioning and prospective memory in young children. *Cognitive Development*, S0885201411000384. https://doi.org/10.1016/j.cogdev.2011.06.002

McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly, 21*(4), 471–490. https://doi.org/10.1016/j.ecresq.2006.09.003

McClelland, M. M., & Cameron, C. E. (2012). Self-regulation in early childhood: Improving conceptual clarity and developing ecologically valid measures. *Child Development Perspectives, 6*(2), 136–142. https://doi.org/10.1111/j.1750-8606.2011.00191.x

McClelland, M. M., Cameron, C. E., Duncan, R., Bowles, R. P., Acock, A. C., Miao, A., & Pratt, M. E. (2014). Predictors of early growth in academic achievement: The head-toes-knees-shoulders task. *Frontiers in Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.00599

McClelland, M. M., Cameron, C. E., Wanless, S. B., Murry, A., Saracho, O., & Spodek, B. (2007). Executive function, behavioral self-regulation, and social-emotional competence. In O. Saracho (Ed.), *Contemporary perspectives on social learning in early childhood education* (pp. 113–137). Charlotte, NC: Information Age Publishing.

McClelland, M. M., & Morrison, F. J. (2003). The emergence of learning-related social skills in preschool children. *Early Childhood Research Quarterly*, *18*(2), 206–224. https://doi.org/10.1016/S0885-2006(03)00026-7

McDermott, P. A., Rikoon, S. H., & Fantuzzo, J. W. (2014). Tracing children's approaches to learning through Head Start, kindergarten, and first grade: Different pathways to different outcomes. *Journal of Educational Psychology*, *106*(1), 200–213. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0033547

McDermott, P. A., Rovine, M. J., Reyes, R. S., Chao, J. L., Scruggs, R., Buek, K., & Fantuzzo, J. W. (2018). Trajectories of early education learning behaviors among children at risk: A growth mixture modeling approach. *Psychology in the Schools*, *55*(10), 1205–1223. https://doi.org/10.1002/pits.22145

McWayne, C., Cheung, K., Wright, L. E., & Hahs-Vaughn, D. L. (2012). Patterns of school readiness among head start children: Meaningful within-group variability during the transition to kindergarten. *Journal of Educational Psychology*, *104*(3), 862–878. https://doi.org/10.1037/a0028884

McWayne, C., Fantuzzo, J. W., & McDermott, P. A. (2004). Preschool competency in context: An investigation of the unique contribution of child competencies to early academic success. *Developmental Psychology*, *40*(4), 633–645. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/0012-1649.40.4.633

McWayne, C., Hahs-Vaughn, D. L., Cheung, K., & Wright, L. E. G. (2012). National profiles of school readiness skills for Head Start children: An investigation of stability and change. *Early Childhood Research Quarterly*, *27*(4), 668–683. https://doi.org/10.1016/j.ecresq.2011.10.002

Meng, C. (2015). Classroom quality and academic skills: Approaches to learning as a moderator. *School Psychology Quarterly*, *30*(4), 553–563. https://doi.org/10.1037/spq0000108

Montroy, J. J., Bowles, R. P., Skibbe, L. E., & Foster, T. D. (2014). Social skills and problem behaviors as mediators of the relationship between behavioral self-regulation and academic achievement. *Early Childhood Research Quarterly*, *29*(3), 298–309. https://doi.org/10.1016/j.ecresq.2014.03.002

Morgan, P. L., Farkas, G., & Qiong Wu. (2009). Five-year growth trajectories of kindergarten children with learning difficulties in mathematics. *Journal of Learning Disabilities*, *42*(4), 306–321. https://doi.org/10.1177/0022219408331037

Morrison, F. J., Ponitz, C. C., & McClelland, M. M. (2010). Self-regulation and academic achievement in the transition to school. In S. D. Calkins & M. A. Bell (Eds.), *Child development at the intersection of emotion and cognition* (pp. 203–224). Washington, DC: American Psychological Association.

Muthen, B. (2001). Latent variable mixture modeling. In G. Marcoulides & R. Schumacker (Eds.), *New Developments and Techniques in Structural Equation Modeling*. New York: Physchology Press.

Muthén, B. O. (1989). Latent variable modeling in heterogeneous populations. *Psychometrika*, *54*(4), 557–585. https://doi.org/10.1007/BF02296397

Nelson, T. D., Nelson, J. M., James, T. D., Clark, C. A. C., Kidwell, K. M., & Espy, K. A. (2017). Executive control goes to school: Implications of preschool executive performance for observed elementary classroom learning engagement. *Developmental Psychology*, *53*(5), 836–844. http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/dev0000296

Nesbitt, K. T., Farran, D. C., & Fuhs, M. W. (2015). Executive function skills and academic achievement gains in prekindergarten: Contributions of learning-related behaviors. *Developmental Psychology*, *51*(7), 865–878. https://doi.org/10.1037/dev0000021

Neuenschwander, R., Röthlisberger, M., Cimeli, P., & Roebers, C. M. (2012). How do different aspects of self-regulation predict successful adaptation to school? *Journal of Experimental Child Psychology*, *113*(3), 353–371. https://doi.org/10.1016/j.jecp.2012.07.004

Pagani, L. S., Fitzpatrick, C., & Parent, S. (2012). Relating Kindergarten Attention to Subsequent Developmental Pathways of Classroom Engagement in Elementary School. *Journal of Abnormal Child Psychology*, *40*(5), 715–725. https://doi.org/10.1007/s10802-011-9605-4

Panter, J. E., & Bracken, B. A. (2009). Validity of the Bracken School Readiness Assessment for predicting first grade readiness. *Psychology in the Schools*, *46*(5), 397–409. https://doi.org/10.1002/pits.20385

Ponitz, C. C., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology*, *45*(3), 605–619. https://doi.org/10.1037/a0015365

Pratt, M. E., Swanson, J., van Huisstede, L., & Gaias, L. M. (2019). Cumulative family stressors and kindergarten adjustment: The exacerbating role of teacher–child conflict. *Merrill-Palmer Quarterly*, *65*(1), 28–53. Retrieved from JSTOR.

Racz, S. J., O'Brennan, L. M., Bradshaw, C. P., & Leaf, P. J. (2016). The influence of family and teacher factors on early disruptive school behaviors: A latent profile transition analysis. *Journal of Emotional and Behavioral Disorders*, *24*(2), 67–81. https://doi.org/10.1177/1063426615599541

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2012). The implications of early attentional regulation for school success among low-income children. *Journal of Applied*

Developmental Psychology, *33*(6), 311–319. https://doi.org/10.1016/j.appdev.2012.07.005

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2015). Are approaches to learning in kindergarten associated with academic and social competence similarly? *Child & Youth Care Forum*, *44*(6), 757–776. https://doi.org/10.1007/s10566-015-9307-0

Rhoades, B. L., Greenberg, M. T., & Domitrovich, C. E. (2009). The contribution of inhibitory control to preschoolers' social–emotional competence. *Journal of Applied Developmental Psychology*, *30*(3), 310–320. https://doi.org/10.1016/j.appdev.2008.12.012

Rhoades, B. L., Warren, H. K., Domitrovich, C. E., & Greenberg, M. T. (2011). Examining the link between preschool social–emotional competence and first grade academic achievement: The role of attention skills. *Early Childhood Research Quarterly*, *26*(2), 182–191. https://doi.org/10.1016/j.ecresq.2010.07.003

Rimm-Kaufman, S. E., & Pianta, R. C. (2000). An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. *Journal of Applied Developmental Psychology*, *21*(5), 491–511. https://doi.org/10.1016/S0193-3973(00)00051-4

Robinson, K. (2013). Early disparities in mathematics gains among poor and non-poor children: Examining the role of behavioral engagement in learning. *The Elementary School Journal*, *114*(1), 22–47. https://doi.org/10.1086/670737

Rothbart, M. K., Posner, M. I., & Kieras, J. (2006). Temperament, attention, and the development of self-regulation. In *Blackwell handbook of early childhood development* (pp. 338–357). https://doi.org/10.1002/9780470757703.ch17

Russo, J. M., Williford, A. P., Markowitz, A. J., Vitiello, V. E., & Bassok, D. (2019). Examining the validity of a widely-used school readiness assessment: Implications for teachers and early childhood programs. *Early Childhood Research Quarterly*, *48*, 14–25. https://doi.org/10.1016/j.ecresq.2019.02.003

Sabol, T. J., Bohlmann, N. L., & Downer, J. T. (2018). Low-income ethnically diverse children's engagement as a predictor of school readiness above preschool classroom quality. *Child Development*, *89*(2), 556–576. https://doi.org/10.1111/cdev.12832

Sabol, T. J., & Pianta, R. C. (2012). Patterns of school readiness forecast achievement and socioemotional development at the end of elementary school. *Child Development*, *83*(1), 282–299. https://doi.org/10.1111/j.1467-8624.2011.01678.x

Sasser, T. R., Bierman, K. L., & Heinrichs, B. (2015). Executive functioning and school adjustment: The mediational role of pre-kindergarten learning-related behaviors. *Early Childhood Research Quarterly*, *30*, 70–79. https://doi.org/10.1016/j.ecresq.2014.09.001

Smith-Donald, R., Raver, C. C., Hayes, T., & Richardson, B. (2007). Preliminary construct and concurrent validity of the Preschool Self-regulation Assessment (PSRA) for field-based research. *Early Childhood Research Quarterly*, *22*(2), 173–187. https://doi.org/10.1016/j.ecresq.2007.01.002

Snyder, T., de Brey, C., & Dillow, S. (2018). *Digest of Education Statistics 2016* (No. NCES 2017-094). U.S. Department of Education, Washington DC: Institute of Education Sciences National National Center for Educational Statistics.

Stipek, D., Newton, S., & Chudgar, A. (2010). Learning-related behaviors and literacy achievement in elementary school-aged children. *Early Childhood Research Quarterly*, *25*(3), 385–395. https://doi.org/10.1016/j.ecresq.2009.12.001

Sung, J., & Wickrama, K. A. S. (2018). Longitudinal relationship between early academic achievement and executive function: Mediating role of approaches to learning. *Contemporary Educational Psychology*, *54*, 171–183. https://doi.org/10.1016/j.cedpsych.2018.06.010

Tan, M., & Dobbs-Oates, J. (2013). Relationship between emergent literacy and early social–emotional development in preschool children from low-income backgrounds. *Early Child Development and Care*, *183*(11), 1509–1530. https://doi.org/10.1080/03004430.2012.729051

Thomson, K. C., Guhn, M., Richardson, C. G., Ark, T. K., & Shoveller, J. (2017). Profiles of children's social–emotional health at school entry and associated income, gender and language inequalities: A cross-sectional population-based study in British Columbia, Canada. *BMJ Open*, *7*(7), e015353. https://doi.org/10.1136/bmjopen-2016-015353

University of Virginia CASTL. (2012). *The Individualized Clasroom Assessment Scoring System Pre-k Technical Manual*. Charlottesvill, VA: Center for Advanced Study of Teaching and Learning, University of Virginia.

Ursache, A., Blair, C., & Raver, C. C. (2012). The promotion of self-regulation as a means of enhancing school readiness and early achievement in children at risk for school failure. *Child Development Perspectives*, *6*(2), 122–128. https://doi.org/10.1111/j.1750-8606.2011.00209.x

Vaughn, M. G., DeLisi, M., Beaver, K. M., & Wright, J. P. (2009). Identifying latent classes of behavioral risk based on early childhood: Manifestations of self-control. *Youth Violence and Juvenile Justice*, *7*(1), 16–31. https://doi.org/10.1177/1541204008324911

Vitiello, V. E., Booren, L. M., Downer, J. T., & Williford, A. P. (2012). Variation in children's classroom engagement throughout a day in preschool: Relations to classroom and child factors. *Early Childhood Research Quarterly*, *27*(2), 210–220. https://doi.org/10.1016/j.ecresq.2011.08.005

Vitiello, V. E., & Greenfield, D. B. (2017). Executive functions and approaches to learning in predicting school readiness. *Journal of Applied Developmental Psychology*, *53*, 1–9. https://doi.org/10.1016/j.appdev.2017.08.004

Vitiello, V. E., Greenfield, D. B., Munis, P., & George, J. (2011). Cognitive flexibility, approaches to learning, and academic school readiness in Head Start preschool children. *Early Education and Development*, *22*(3), 388–410. https://doi.org/10.1080/10409289.2011.538366

Volpe, R. J., DiPerna, J. C., Hintze, J. M., & Shapiro, E. S. (2005). Observing students in classroom settings: A review of seven coding schemes. *School Psychology Review*, *34*(4), 454–474.

Wanless, S. B., McClelland, M. M., Tominey, S., & Acock, A. (2011). The influence of demographic risk factors on children's behavioral regulation in prekindergarten and kindergarten. *Early Education & Development*, *22*(3), 461–488.

Weiland, C., Barata, M. C., & Yoshikawa, H. (2014). The Co-Occurring Development of Executive Function Skills and Receptive Vocabulary in Preschool-Aged Children: A Look at the Direction of the Developmental Pathways: Executive Function and Receptive Vocabulary Development in Preschool. *Infant and Child Development*, *23*(1), 4–21. https://doi.org/10.1002/icd.1829

Williford, A. P., Whittaker, J. E. V., Vitiello, V. E., & Downer, J. T. (2013). Children's engagement within the preschool classroom and their development of self-regulation. *Early Education and Development*, *24*(2), 162–187. https://doi.org/10.1080/10409289.2011.628270

Wilson, P. (2004). A preliminary investigation of an early intervention program: Examining the intervention effectiveness of the Bracken Concept Development Program and the Bracken Basic Concept Scale-Revised with Head Start students. *Psychology in the Schools*, *41*(3), 301–311. https://doi.org/10.1002/pits.10159

Woodcock, R.W., Mcgrew, K. S., & Mather, N. (2001). *Woodcock-Johnson III Tests of Achievement*. Rolling Meadows, IL: Riverside Publishers.

Yoder, M. L., Williford, A. P., & Vitiello, V. E. (2019). Observed quality of classroom peer engagement in a sample of preschoolers displaying disruptive behaviors. *Early Childhood Research Quarterly*, *47*, 206–217. https://doi.org/10.1016/j.ecresq.2018.12.011

Youn, M. (2016). The effects of Head Start duration on the behavioral competence of socially disadvantaged children. *Journal of Community Psychology*, *44*(8), 980–996. https://doi.org/10.1002/jcop.21822

Zentner, M., & Bates, J. E. (2008). Child temperament: An integrative review of concepts, research programs, and measures. *International Journal of Developmental Science*, *2*(1–2), 7–37. https://doi.org/10.3233/DEV-2008-21203

Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and differences in the research on children's effortful control and executive function: A call for an integrated model of self-regulation. *Child Development Perspectives*, *6*(2), 112–121. https://doi.org/10.1111/j.1750-8606.2011.00176.x

Appendix A Measurement Models

Figure 3. *Proposed Measurement Model.*

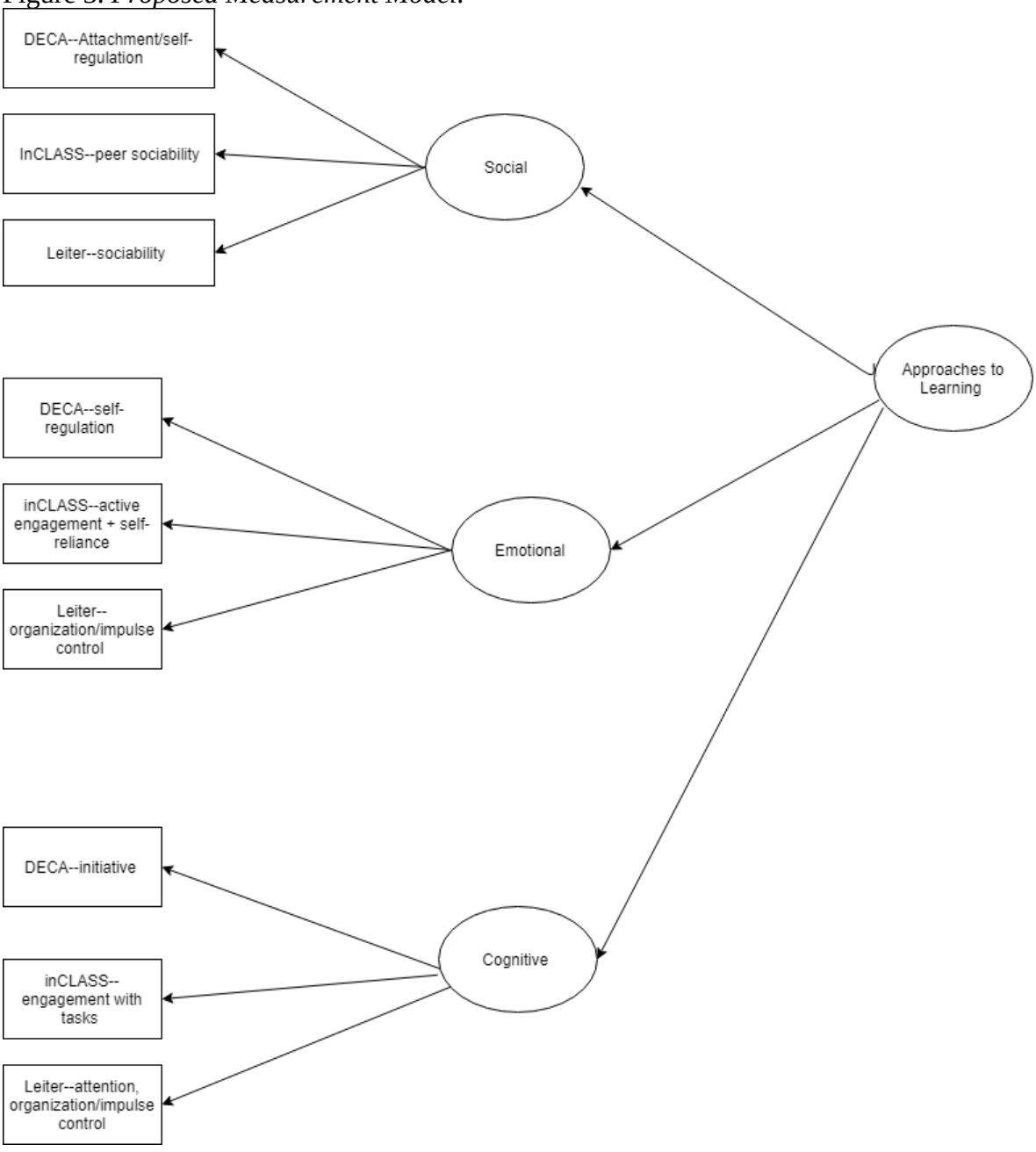


Figure 3. Proposed measurement model. The words in circles represent latent constructs, while the words in rectangles represent subscales from measurements.

Table 3

Item-Level Responses and Corresponding Latent Variables by Measurement

	Components		
Assessment	Social	Emotional	Cognitive
DECA	Cooperates with others	Controls his/her anger	Try different ways to solve a problem
	Shares with other children	Handles frustration well	Make decisions for himself/herself
	Appears happy when playing with others	Shows patience	Chooses to do a task that was hard
		Accepts another choice	
		Shows an interest in learning new things	
		Keeps trying when unsuccessful	
		Tries new things	
inCLASS	Proximity seeking	Enthusiasm	Sustained attention
	Shared positive affect	Personal initiative	Self-directed learning
	Popularity	Independence	
	Perspective-taking	Persistence	
	Cooperation		
Leiter		Inhibits verbalizations appropriately (does not blurt out)	Pays attention
		Lets examiner finish before starting task	Interested in accuracy
		Refrains from touching materials	Sustain concentration
		Focuses without fidgeting	Stays on task
		Remains in seat appropriately	Focused on task
			Thinks and plans before beginning
			Indicates if doesn't understand task
			Organized

Appendix B Sample Measures

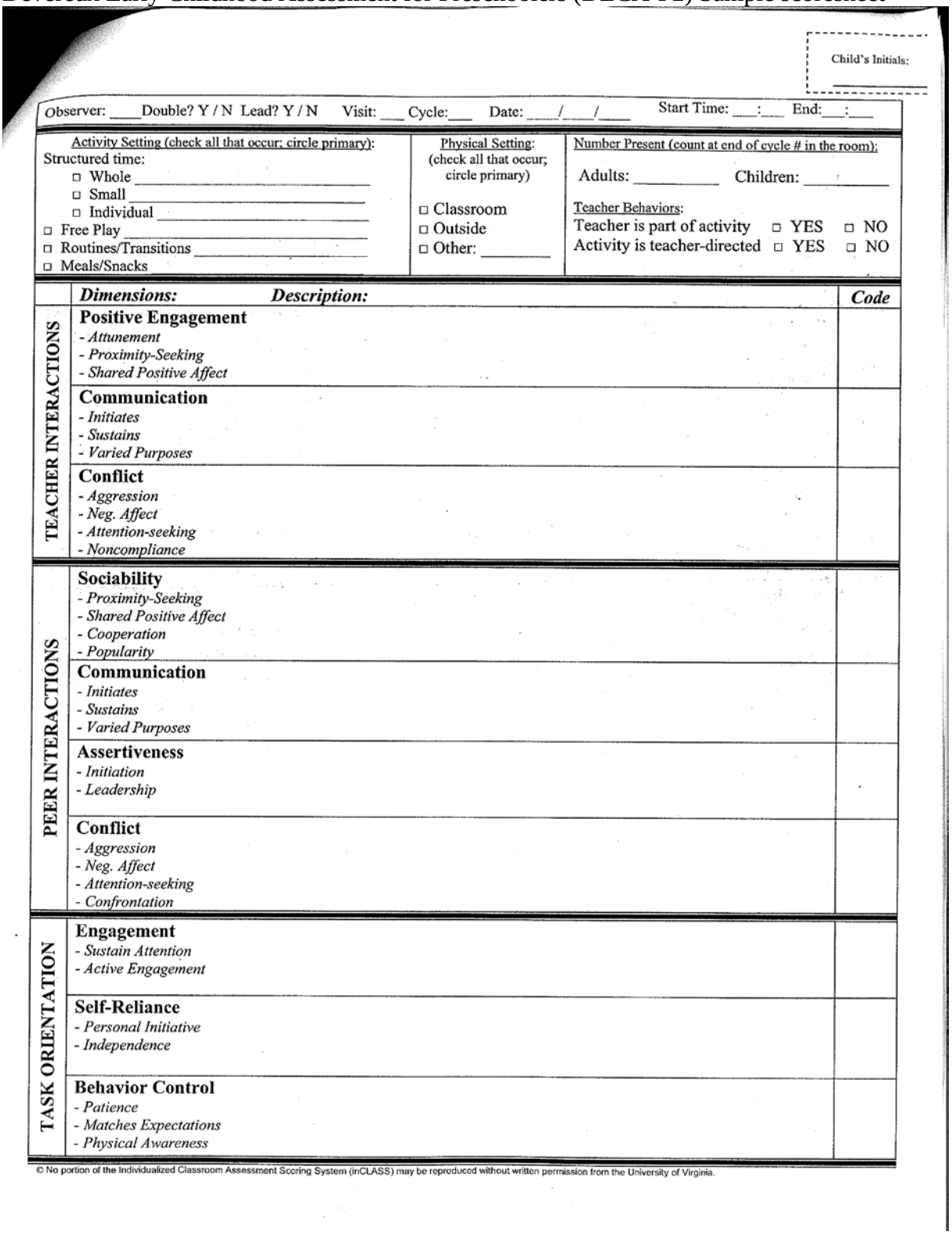
The inCLASS Domains, Dimensions and Definitions

The inCLASS Domains, Dimensions, and Definitions

Domain	Dimension	Definition
Teacher Interactions	Positive Engagement with the Teacher	Measures the degree to which the child is emotionally connected to the teacher(s) and adults, including seeking and enjoying interactions with them, and using them as a secure base.
	Teacher Communication	Measures the degree to which the child initiates and maintains conversation with the teacher(s) and adults while using language as a functional tool to make needs, emotions, and opinions known (e.g., requesting, commenting, and questioning).
	Teacher Conflict	Measures the degree to which the child's interactions with the teacher(s) and adults are characterized by tension, resistance, and negativity.
Peer Interactions	Peer Sociability	Measures the degree to which the child experiences positive emotions and behaviors with other children, including the tendency to seek peer interactions, show social awareness and respond in a manner that peers react positively to.
	Peer Communication	Measures the degree to which the child initiates and maintains conversation with other children while using language as a functional tool to make needs, emotions, and opinions known (e.g., requesting, commenting, and questioning).
	Peer Assertiveness	Measures the degree to which the child uses positive strategies to initiate and lead interactions with other children, and the degree to which those strategies are successful.
	Peer Conflict	Measures the degree to which the child's interactions with other children are characterized by tension, resistance, and negativity.
Task Orientation	Engagement within Tasks	Measures the degree to which the child is consistently and actively involved in classroom tasks and activities, including the amount of time the child remains focused on any given activity, the level of intensity or enthusiasm displayed, and the proportion of time the child spends on assigned activities.
	Self-Reliance	Measures the degree to which the child takes learning into their own hands, including seeking opportunities rather than passively waiting for teacher direction, and making best use of classroom resources (including the teacher).
	Behavior Control	Measures the degree to which the child regulates movement, physical activity, and verbalizations, so that these match the expectations of the setting.

InCLASS Sample Scoresheet

Devereux Early Childhood Assessment for Preschoolers (DECA-P2) Sample scoresheet



Child's Initials: _____

Observer: ____Double? Y / N Lead? Y / N Visit: ___ Cycle:___ Date: ____/____/____ Start Time: ___:___ End:___:___

Activity Setting (check all that occur; circle primary):
Structured time:
- ☐ Whole _____
- ☐ Small _____
- ☐ Individual _____

☐ Free Play _____
☐ Routines/Transitions _____
☐ Meals/Snacks

Physical Setting: (check all that occur; circle primary)
☐ Classroom
☐ Outside
☐ Other: _____

Number Present (count at end of cycle # in the room):
Adults: _____ Children: _____

Teacher Behaviors:
Teacher is part of activity ☐ YES ☐ NO
Activity is teacher-directed ☐ YES ☐ NO

	Dimensions:	Description:	Code
TEACHER INTERACTIONS	**Positive Engagement**	*- Attunement* *- Proximity-Seeking* *- Shared Positive Affect*	
	Communication	*- Initiates* *- Sustains* *- Varied Purposes*	
	Conflict	*- Aggression* *- Neg. Affect* *- Attention-seeking* *- Noncompliance*	
PEER INTERACTIONS	**Sociability**	*- Proximity-Seeking* *- Shared Positive Affect* *- Cooperation* *- Popularity*	
	Communication	*- Initiates* *- Sustains* *- Varied Purposes*	
	Assertiveness	*- Initiation* *- Leadership*	
	Conflict	*- Aggression* *- Neg. Affect* *- Attention-seeking* *- Confrontation*	
TASK ORIENTATION	**Engagement**	*- Sustain Attention* *- Active Engagement*	
	Self-Reliance	*- Personal Initiative* *- Independence*	
	Behavior Control	*- Patience* *- Matches Expectations* *- Physical Awareness*	

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Sample Leiter-3 Examiner Rating Scale

Devereux Early Childhood Assessment for Preschoolers Second Edition (DECA-P2)

(for children ages 3 through 5 years)

Paul A. LeBuffe ■ Jack A. Naglieri

Child's Name: _____ Gender: _____ Date of Birth: _____

Program/Site: _____ Classroom/Group: _____ Age: _____

Person Completing this Form: _____ Relationship to Child: _____ Date of Rating: _____

This form describes a number of behaviors seen in some young children. Read the statements that follow the phrase: ***During the past 4 weeks, how often did the child...*** and place a check mark in the box underneath the word that tells how often you saw the behavior. Please answer each question carefully. There are no right or wrong answers. If you wish to change your answer, put an [X] through it and fill in your new choice as shown to the right. Please do not skip any items.

Never	Rarely	Occasionally	Frequently	Very Frequently
☒	☑	☐	☐	☐

Item#	During the past 4 weeks, how often did the child...	Never ✓	Rarely ✓	Occasionally ✓	Frequently ✓	Very Frequently ✓
1.	act in a way that made adults smile or show interest in him/her?	☐	☐	☐	☐	☐
2.	listen to or respect others?	☐	☐	☐	☐	☐
3.	control his/her anger?	☐	☐	☐	☐	☐
4.	seem sad or unemotional at a happy occasion?	☐	☐	☐	☐	☐
5.	show confidence in his/her abilities (for instance, say "I can do it!")?	☐	☐	☐	☐	☐
6.	have a temper tantrum?	☐	☐	☐	☐	☐
7.	keep trying when unsuccessful (show persistence)?	☐	☐	☐	☐	☐
8.	seem uninterested in other children or adults?	☐	☐	☐	☐	☐
9.	use obscene gestures or offensive language?	☐	☐	☐	☐	☐
10.	try different ways to solve a problem?	☐	☐	☐	☐	☐
11.	seem happy or excited to see his/her parent or guardian?	☐	☐	☐	☐	☐
12.	destroy or damage property?	☐	☐	☐	☐	☐
13.	try or ask to try new things or activities?	☐	☐	☐	☐	☐
14.	show affection for familiar adults?	☐	☐	☐	☐	☐
15.	start or organize play with other children?	☐	☐	☐	☐	☐
16.	show patience?	☐	☐	☐	☐	☐
17.	ask adults to play with or read to him/her?	☐	☐	☐	☐	☐
18.	have a short attention span (difficulty concentrating)?	☐	☐	☐	☐	☐
19.	share with other children?	☐	☐	☐	☐	☐
20.	handle frustration well?	☐	☐	☐	☐	☐
21.	fight with other children?	☐	☐	☐	☐	☐
22.	become upset or cry easily?	☐	☐	☐	☐	☐
23.	show an interest in learning new things?	☐	☐	☐	☐	☐
24.	trust familiar adults and believe what they say?	☐	☐	☐	☐	☐
25.	accept another choice when his/her first choice was not available?	☐	☐	☐	☐	☐
26.	seek help from children/adults when necessary?	☐	☐	☐	☐	☐
27.	hurt others with actions or words?	☐	☐	☐	☐	☐
28.	cooperate with others?	☐	☐	☐	☐	☐
29.	calm himself/herself down?	☐	☐	☐	☐	☐
30.	get easily distracted?	☐	☐	☐	☐	☐
31.	make decisions for himself/herself?	☐	☐	☐	☐	☐
32.	appear happy when playing with others?	☐	☐	☐	☐	☐
33.	choose to do a task that was hard for him/her?	☐	☐	☐	☐	☐
34.	look forward to activities at home or school (for instance, birthdays or trips)?	☐	☐	☐	☐	☐
35.	touch children or adults in a way that you thought was inappropriate?	☐	☐	☐	☐	☐
36.	show a preference for a certain adult, teacher, or parent?	☐	☐	☐	☐	☐
37.	play well with others?	☐	☐	☐	☐	☐
38.	remember important information?	☐	☐	☐	☐	☐

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1-800-334-2014

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Appendix C Projected Timeline and Possible Journals

Month	Task
October-	Work on theoretical article (RQ1)
November	Read and develop understanding of LPA
	Finalize dataset--run descriptive statistics, impute missing data
December	Analyze data for article 2 and 3
	Create tables for articles
January	Write article 2
	Make revisions to article 1
February	Make revisions to article 2
	File Graduation application (final day to file application, February 15th)
March	Write article 3
	Review article 1 & 2
April	make final revisions for articles 2 & 3
	April 17th—Submit dissertation to committee
	April 19—final day to request authority for thesis defense
May	May 1st—defend dissertation (May 2nd—Final day for dissertation defense)
	May 10th—Final day to submit dissertation to SHAREOK

Possible Journals

Early Education and Development

Learning and Instruction

Learning Environments Research

Current Issues in Education

Journal of Educational Research

Journal of Research in Childhood Education

Child Development Perspectives

Journal of Educational Measurement