

The Developmental Environmental Rating Scale (DERS)

Key Points

- The DERS is classroom observation tool designed to measure the quality of developmental learning environments. It is a measure of inputs such as adult behaviors and environmental elements, not a direct measure of outputs such as executive function.
- The definition of quality governing the design of the DERS conforms to widely accepted key precepts of physical, cognitive, social, and emotional development.
- The DERS aligns developmentally relevant outputs such as executive functions, linguistic and cultural fluency, and social/emotional learning with inputs shown by robust research to support their growth.
- Data collection in the pilot year is aimed at testing a correlation between the DERS and executive function outcomes.

Introduction: What is the DERS?

The Developmental Environmental Rating Scale (DERS) is a classroom observation tool that measures the quality of learning environments serving children between the ages of 2.5 and 12. The fundamental purpose of the DERS is to provide a detailed and multidimensional view of what actually goes on inside classrooms, particularly classrooms directed toward supporting optimal human development. The tool aligns environmental design and implementation with desired outcomes related to executive function, linguistic and cultural fluency, and social-emotional learning. It is intended for use by teachers, educational leaders and researchers for both formative and summative assessment of classrooms.

Developed over the course of four years of classroom-based research combined with comprehensive reviews of the literature on cognition and pedagogy, the DERS is an elaborated sequence of scales indicating item presence, magnitude, and frequency. 60 items are organized across three observational categories—children, adults, and the environment—and scored using an iPad app during a one-hour classroom observation. At the end of an observation, the app generates a narrative report, a numerical rating, and a graphic display of the items. Use of the DERS requires training and certification directed toward achieving inter-rater reliability.

While other instruments exist to measure classroom quality,¹ the DERS is unique in three ways. First, the DERS is explicitly framed by the theory and practice of developmental learning. Second, the DERS offers an unusual degree of specificity with regard to classroom attributes that support human development. Finally, the DERS aligns attributes that characterize the *inputs* of developmental

education with desired *outcomes* such as curiosity, empathy, persistence, reason, and self-regulation. Grounded in research on cognition and pedagogy, the DERS honors the complexity of student-centered, developmental learning environments while highlighting key environmental characteristics as they relate to wide-scope, developmental outcomes.

The DERS and Montessori

Although it was inspired by the specificity and coherence of Montessori learning environments, DERS items are not tied to specific features of Montessori pedagogy. Rather, the tool can be used in a range of education/ developmental settings. Still, numerous features of fully implemented Montessori (such as choice, mixed-age groupings, and uncluttered environments) align well with the research supporting the DERS indicators.

Linking Outcomes to Inputs

The 60 items comprising the DERS are clustered around three broad aspects of human development: executive functions, linguistic and cultural fluency, and social/emotional learning. Executive function is delineated into its three common factors,² creating five outcome domains illustrated in Figure 1:

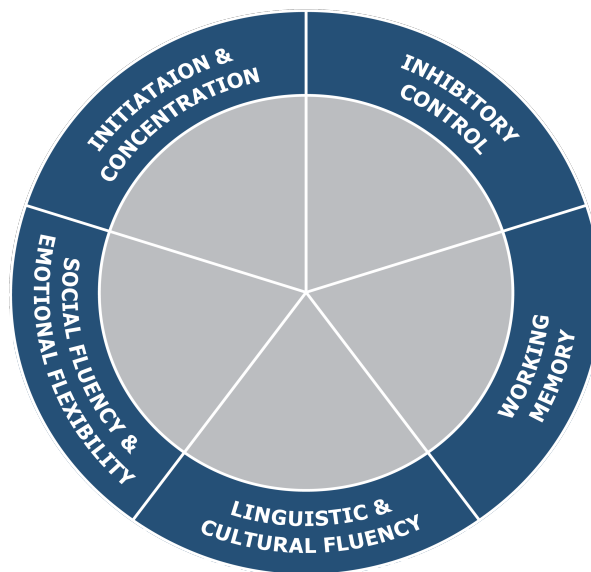


Figure 1: DERS Outcome Domains

The first three domains (Initiation and Concentration, Inhibitory Control, Working Memory) function as a cluster of executive function capacities, which, together, have been associated with critical cognitive and social outcomes as well as general life success.³ The fourth domain, Linguistic and Cultural Fluency, is built upon a research base that situates language development within cultural context.⁴ In addition, cultural and linguistic competence are strongly linked to emotion. That is, meaningful

communication is emotive as well as cognitive. It is catalyzed by the desire for connection, and enabled by sensitivity and responsiveness. Similarly, the fifth domain, Social Fluency and Emotional Flexibility links capacities such as the ability to recognize social cues with emotion regulation, self-efficacy, and resilience.⁵

All five DERS domains have distinct as well as overlapping characteristics. Executive functions (EFs), for instance, which are often described as “the air traffic controller of the brain”⁶, include such capacities as attention, inhibition, shift, and working memory. EFs enable us to control our actions, intentions, and emotions; EFs influence how we navigate challenges and solve problems.⁷ It is not surprising, therefore, that EFs correlate with academic, social, and emotional outcomes. Working memory—or the ability to hold information in mind while using it—is key to, among other things, learning to read and performing mathematical calculations.⁸ Likewise, impulse control and cognitive flexibility are necessary for both competent social interaction and emotional regulation.⁹ EFs play an overarching and, at times, integrative role, in healthy human development,¹⁰ and the DERS is designed to reflect the holistic manner in which development occurs.

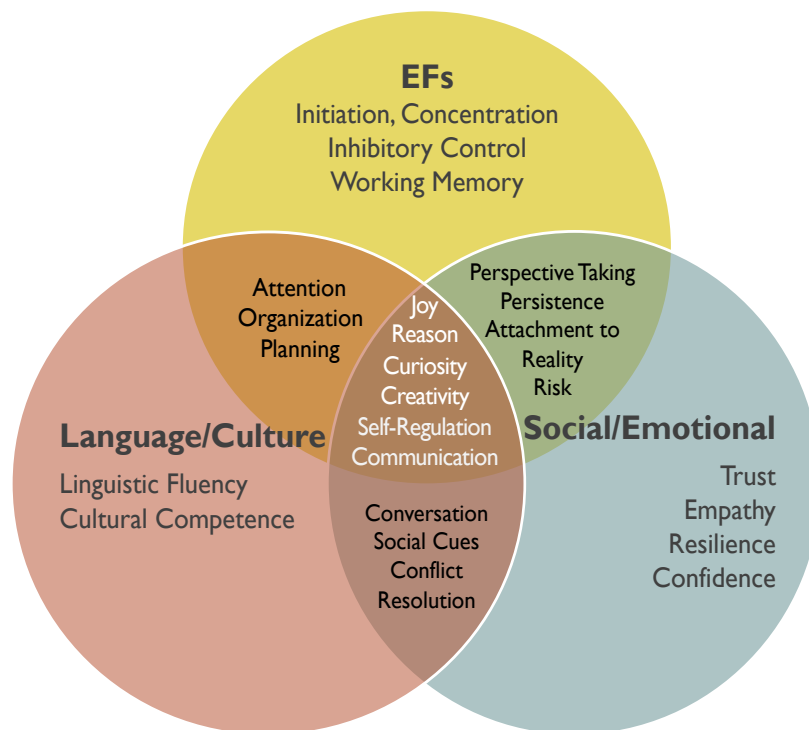


Figure 2: Wide-Scope Developmental Outcomes

Figure 2 illustrates how key aspects of human development—those addressed by the DERS—interact and, often, overlap.

The Theoretical Base

Consistent with an expanding literature that argues for re-framing what meaningful learning entails and how schools should organize themselves to achieve such learning,¹¹ the DERS is grounded in a transparent set of propositions related to what constitutes outcomes that matter. Additionally, although the DERS does not assess those outcomes, it does assume that they are describable and measurable as discrete sets of skills and understandings. Perhaps most important, the DERS assumes that those same skills and understandings are inextricably connected.

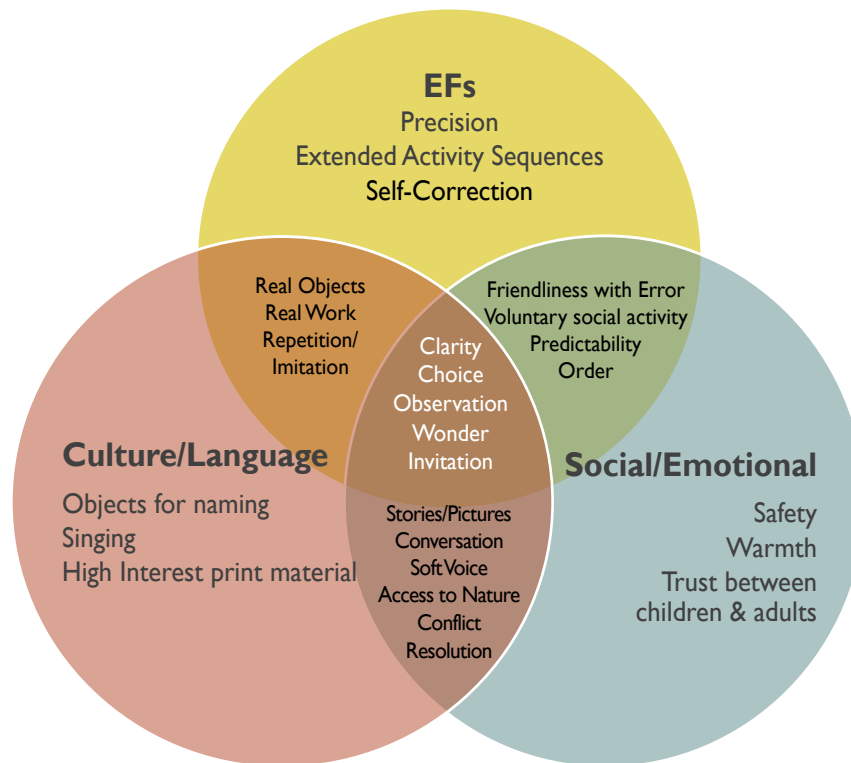


Figure 2: Mapping Inputs and Outcomes

Figure 3, above, illustrates the way items (inputs) such as precision, objects for naming, and warmth map onto the outcome domains addressed by the DERS.

The integrated manner in which inputs affect outcomes suggests that educational programs aimed toward achieving wide-scope developmental outcomes should be devoted primarily, if not exclusively, to cultivating the skills and understandings necessary to realize those outcomes. Within this frame,

isolated interventions designed to boost EFs or creativity or persistence are not likely to succeed—not because such strategies are inherently without merit, but because development is a holistic enterprise. Achieving wide-scope outcomes calls for a wide-scope educational approach.

Developmental classrooms

We define developmental classrooms as learning environments that, by design, conform to key precepts of physical, cognitive, social, and emotional development. Those precepts, which are both widely accepted by practitioners and robustly supported by research on how humans learn, include:

- **Human development is an integrated process**, in which physical, cognitive, social, and emotional growth are linked and, often, codependent. Cognitive development, for instance, is inseparable from motor development.
- **Human development is a gradual, continuous, and cumulative process**, based on patterns of neurological development that are hierarchical and predictable. The process begins at birth, with the formation of locally organized cognitive structures that, with maturation, establish distributed functional networks. Human development is protracted, continuing through one's early twenties.
- **Human development is an active process**, the majority of which occurs organically through self-directed interactions with people, objects, and concepts. Humans are biologically driven to explore, and we construct understanding through experimental experiences with our environment, including peers, adults, and the attributes of the physical space itself.
- **The quality of the environment within which learners interact can either foster or impede healthy development.** Environments that nurture optimal development are enriched, orderly, predictable, peaceful, allow for guided choice, free movement, voluntary social activity, and extended opportunities for trial and error correction.

Thus, the descriptor “developmental” is meant to both capture these precepts and point toward characteristics of environments most likely to foster optimal learning.

The Research Base

Executive Functions

Environments that foster the development of EFs have several features in common. First, they allow for free movement, choice, and opportunities for self-directed exploration, and trial and error-correction.¹² Second, they are orderly and free of clutter. Visual and spatial clarity enables attention, focus, and calm.¹³ Environments that offer opportunity for choice, combined with uninterrupted engagement and friendliness with error are likely to be places where initiation, focus, repetition, persistence, and enjoyment are observed consistently among children.¹⁴

Adults in developmental environments encourage attention, persistence, and flexibility by inviting, rather than commanding, engagement, and by actively protecting that engagement through moves such as refraining from interruption, excessive error correction, or unnecessary direction.¹⁵ Adults can support the development of working memory through meticulous attention to the clarity of their speech, the precision of their movements and the general consistency and predictability of their behavior.¹⁶ As a result, children in developmental classrooms also demonstrate the capacity to re-focus their attention, inhibit behavior, and withhold gratification.¹⁷

Linguistic and Cultural Fluency

The ability to communicate through both oral and written language involves much more than phonemic awareness and vocabulary development—the development of language and thought go hand in hand. Language is also an emotional phenomenon, inspired by the desire for connection and enhanced by the doors to discovery it opens.¹⁸ Linguistic fluency is tied to cultural understanding.¹⁹ Learning environments that are truly “language rich” build from a foundation of order, calm, and beauty. They are filled with intentionally curated items for children to name, manipulate, and consider. Adults use language intentionally, speaking with and not at children, enunciating words with care, and, generally, focusing more on the quality rather than the quantity of spoken interaction.²⁰

Social Fluency and Emotional Flexibility

Because communication is, foremost, a social activity, language and social development, which are both grounded in culture, are key partners. Likewise, EFs strongly correlate with emotional regulation and social competence.²¹ Social and emotional development flourishes in environments that allow for spontaneous interaction among peers as well as between children and adults.²² The mimetic nature of social development²³ makes mixed age grouping and intentional adult modeling central to the process of both social and linguistic fluency—indeed, these processes are indivisible.²⁴ Environments that nurture emotional flexibility are safe places, signaled by an overall climate of tranquility and beauty²⁵ as well as access to nature.²⁶ Adult behavior supporting emotional flexibility is often characterized by a “just right” balance of warmth, connection and clear boundaries.²⁷

Validity and Reliability

The design phase of the DERS occurred between October 2013 and June 2016. Between June and September 2016, the paper-pencil version of the instrument was converted to a tablet-based app, and between October 2016 and March 2017, 120 users from 30 schools were trained. Since the official DERS iPad app was released in January 2017, 15 users have completed the certification process. As

additional users become certified, score classrooms, and generate reports, we will have sufficient data to report on the validation process.

Content Validity

The DERS is designed to capture the complexity of developmental learning environments, rather than directly measuring Executive Function, Linguistic and Cultural Fluency, or Social Fluency and Emotional Flexibility. Rather, the DERS is an assessment of classroom quality based on three factors:

- an explicit definition of quality grounded in precepts of developmental education
- a conceptual and evidentiary grounding in scholarship related to cognitive, social, and emotional development, learning theory, and ambitious teaching
- an intentional alignment between the 'inputs' and 'outputs' of developmental education

The DERS items are drawn from extensive research about adult behaviors, child behaviors, and environmental attributes that promote the development of EFs, linguistic and cultural fluency, and social fluency and emotional flexibility. The tool relies on this research base as expert consensus for construct validity.

Predictive Validity

The DERS is not a measure of or proxy for student competency in executive function, linguistic and cultural fluency or social fluency and emotional flexibility. Rather, the DERS is an observational tool designed to assess the presence of elements known to nurture these competencies.

However, research suggests that performance on the DERS should predict performance on measures of these outcomes. Predictive validity will be tested during the 2017-2018 academic year by pairing the DERS with the Minnesota Executive Function Scale (MEFS),²⁸ a measure of EFs that is highly reliable, suitable for very young children, and user-friendly. We have bundled training for both tools together; schools that take the combined DERS/MEFS training are then eligible to join the DERS/MEFS Network, a community of practice for school-based continuous improvement using the DERS and MEFS.

Member schools also agree to share their DERS and MEFS data with NCMPS for the purposes of evaluating the predictive power of the DERS with regard to EFs. Classroom DERS scores in domains one, two, and three will be correlated with student MEFS scores to determine the predictive validity of the DERS with regard to EFs. While the MEFS captures the outcomes articulated by the first three domains of the DERS, NCMPS is currently evaluating outcome measures that correspond to domains

four and five. Predictive validity for these outcomes will be assessed after appropriate measures have been identified.

Inter-rater Reliability

Supports for inter-rater reliability are embedded in the DERS training and certification process. In training, users are first oriented to the DERS observable elements and item indicators, and then rate and discuss a sample environment. The DERS trainer facilitates this discussion, supporting correct interpretation and application of the indicators and scoring guide. Users have the opportunity to ask questions, surface preconceived ideas, and resolve misconceptions and biases. Following the training, users practice in live classrooms before scoring a certification video and attending a follow-up norming call led by a DERS trainer. Users then rate live classrooms in pairs, and must achieve a standard of coherence before certification is granted. Early results indicate a high degree of inter-rater reliability, and results will be published after the end of the pilot period.

¹ Denny, Hallam, & Homer, 2012; Hegseth, 2017; Sylva, et al, 2006

² Miyake et al., 2005

³ Blair & Razza, 2007; Mischel, Shoda, & Peake, 1990; Moffitt et al, 2011

⁴ Bruner, 1985; Turner, 2008; Vygotsy, 1978; Wertsh & Tulviste, 1990

⁵ Baumrind, 1989; Eisenberg, et al., 2011; Ivcevic & Brackett, 2014

⁶ Center on the Developing Child at Harvard University, 2011

⁷ Carlson, Zelazo, & Faja, 2013

⁸ Brady & Shankweiler, 1991; Craig & Gilmore, 2014; Jordan & Baker, 2011; Locascio, et al, 2010

⁹ Kutsyuruba, Klinger, & Hussain, 2015; Sugden, et al, 2006

¹⁰ Diamond, 2000, 2013

¹¹ Engel, 2015; Galinsky, 2010; Golinkoff & Hirsh-Pasek, 2016; Heckman & Kautz, 2012

¹² Deci & Ryan, 2000; Deci, Koestner, & Ryan, 1999; Diamond, 2000, 2007, 2012, 2013; Diamond & Lee, 2011; Dweck, 2006; Glenberg, Witt, & Metcalfe, 2013; Iyengar & Lepper, 1999, 2000; Renninger, & Wozniak, 1985; Tanner, 2008

¹³ Barrett, Davies, Zhang, & Barrett, 2015; Fisher, Godwin, & Seltman, 2014; Keupp, Behne, & Rakoczy, 2013; Pagani, Fitzpatrick, & Barnett, 2013; Wachs & Gruen, 1982

¹⁴ Alfieri et al, 2001; Blair & Razza, 2007; Diamond & Lee, 2011; Hidi & Renninger, 2006; Simon, 2001

¹⁵ Diamond & Lee, 2011; Lillard, 2012; Ling, Wong, & Diamond, 2016; Raven, 1994; Whitescarver & Cossentino, 2007

¹⁶ Tomasello, 2003a, 2003b

¹⁷ Eisenberg, et al., 2004; Klein & Seligman, 1976; Lillard, 2012; Mischel, Shoda, & Rodriguez, 1989

¹⁸ Diamond, 2014a, 2014b; Dulay & Burt, 1977

¹⁹ Frijters, Barron, & Brunello, M. 2000; Smith, 1966; Tomasello, 2003b, Tomasello & Ratner, 1993; Turner, 1995

²⁰ Kampmann & Browne, 2011

²¹ Cumberland-Li, Eisenberg, & Rieser, 2004

²² Bailey, Burchinal, & McWilliam, 1993; Booren, Downer, & Vitiello, 2012; Grant, 1993

²³ Hogan & Tudge, 1999; Jackson, 1986; Tomasello, 2003a, 2003b

²⁴ Bruner, 1983; Gupta, 2008; Kuhl, 2007; Vygotsky, 1978

²⁵ Armstrong & Detweiller-Bedell, 2008; Blair, 2010

²⁶ Kellert, 2002; Taylor, Kuo, & Sullivan, 2001, 2002

²⁷ De Wolf & van Ijzendoorn, 1997

²⁸ Carlson & Zelazo, 2014

Bibliography

- Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of Educational Psychology, 103*(1), 1-18. doi: 10.1037/a0021017
- Andersson, Ulf. (2008), Working memory as a predictor of written arithmetical skills in children: The importance of central executive functions. *British Journal of Educational Psychology, 78*, 181–203. doi:10.1348/000709907X209854
- Armstrong, T., & Detweiller-Bedell, B. (2008). Beauty as an emotion: The exhilarating prospect of mastering a challenging world. *Review of General Psychology, 12*(4), 305-329.
- Bailey, D. B., Burchinal, M. R., & McWilliam, R. A. (1993). Age of peers and early childhood development. *Child Development, 64*, 848-862.
- Ball, D. L., & Forzani, F. M. (2009). The work of teaching and the challenge for teacher education. *Journal of Teacher Education, 60*(5), 497–511.
- Ball, D. L., & Forzani, F. M. (2011). Building a common core for learning to teach, and connecting professional learning to practice. *American Educator, 35*(2), 17–21, 38–39.
- Baumrind, D. (1989). Rearing competent children. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 349-78). San Francisco, CA: Jossey-Bass.
- Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment, 89*, 118-133.
- Besançon, M., Lubart, T., & Barbot, B. (2013). Creative giftedness and educational opportunities. *Educational & Child Psychology, 30*(2), 79-88.
- Blair, C. (2010). Stress and the development of self-regulation in context. *Child Development Perspectives, 4*, 181-188.
- Blair, C., & Razza, R. (2007). Relating effortful control, executive function, and false belief understanding in emerging math and literacy ability in kindergarten. *Child Development, 78*(2), 647-653. doi:10.1016/j.jsp.2012.01.001.
- Blair, C., Zelazo, P. D., & Greenberg, M. T. (2005). The measurement of executive function in early childhood. *Developmental Neuropsychology, 28*(2), 561-571.
- Booren, L., Downer, J., & Vitiello, V. (2012). Observation of children's interactions with teachers, peers, and tasks across preschool classroom activity settings. *Early Education and Development, 23*, 517-538.
- Brady, S. A., & Shankweiler, D. P. (1991). The role of working memory in reading disability. *Phonological processes in literacy: A tribute to Isabelle Y. Liberman*, 129-151.
- Bruner, J. (1983). *Child's talk: Learning to use language*. New York, NY: W.W. Norton.
- Carlson, S., Zelazo, P.D. (2014). *The Minnesota executive function scale*. St. Paul: Reflection Sciences.
- Carlson, S. M., & Zelazo, P. D., & Faja, S. (2013). Executive function. In P. D. Zelazo (Ed.), *The Oxford handbook of developmental psychology*, Vol. 1: Body and mind (pp. 706-743). New York: Oxford University Press.
- Carlson, S. M., & White, R. E. (2013). Executive function, pretend play, and imagination. In M. Taylor (Ed.), *The Oxford handbook of the development of imagination* (pp. 161-174). New York, NY: Oxford University Press. doi:10.1016/j.jsp.2012.01.001

- Center on the Developing Child at Harvard University. (2011). *Building the brain's "air traffic control" system: How early experiences shape the development of executive function (Working paper No. 11)*. Retrieved from <http://www.developingchild.harvard.edu>
- Cossentino, J. (2005). Ritualizing expertise: A non-Montessorian view of the Montessori method. *American Journal of Education*, 111(2), 211-244. doi: 10.1086/426838
- Cossentino, J. (2006). Big work: Goodness, vocation, and engagement in the Montessori method. *Curriculum Inquiry*, 36(1), 63-93.
- Cossentino, J. (2009). Culture, craft, & coherence: The unexpected vitality of Montessori teacher training. *Journal of Teacher Education*, 60(5), 520-527. doi: 10.1177/0022487109344593
- Cossentino, J. (2017). Montessori ideology and practice in teacher education, in M. Ben-Peretz and S. Feiman-Nemser (Eds.), *An arena for educational ideologies: Current practices in teacher education programs* (pp. 45-68). New York, NY: Roman Littlefield.
- Cragg, L., & Gilmore, C. (2014). Skills underlying mathematics: The role of executive function in the development of mathematics proficiency. *Trends in Neuroscience and Education*, 3, 63-68. doi:10.1016/j.tine.2013.12.001
- Cuban, L. (2013) *Inside the black box of classroom practice: Change without reform in American education*. Cambridge: Harvard Education Press.
- Cumberland-Li, A., Eisenberg, N., & Rieser, M. (2004). Relations of young children's agreeableness and resiliency to effortful control and impulsivity. *Social Development*, 13(2), 193-212.
- Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., Howe, A. (2012). Creative learning environments in education: A systematic literature review. *Thinking Skills and Creativity*, 8, 80-91.
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.
- Deci, E., Koestner, R., & Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125, 627-668
- Denny, J. H., Hallam, R., & Homer, K. (2012). A multi-instrument examination of preschool classroom quality and the relationship between program, classroom, and teacher characteristics. *Early Education & Development*, 23(5), 678-696.
- De Wolff, M., & van Ijzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68(4), 571-91.
- Diamond, A., (2000). Close interrelation of motor development and cognitive development and of the cerebellum and prefrontal cortex. *Child Development*. 71, 44-56. <http://dx.doi.org/10.1111/1467-8624.00117>.
- Diamond, A. (2007). Interrelated and interdependent. *Developmental Science*, 10(1), 152-158. <http://dx.doi.org/10.1111/j.1467-7687.2007.00578.x>.
- Diamond, A., (2010). The evidence base for improving school outcomes by addressing the whole child and by addressing skills and attitudes, not just content. *Early Education Development*, 21, 780-793. <http://dx.doi.org/10.1080/10409289.2010.514522>.
- Diamond, A. (2012). Activities and programs that improve children's executive functions. *Current Directions in Psychological Science*, 21, 335-341. <http://dx.doi.org/10.1177/0963721412453722>.

- Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, 64, 135–168. <http://dx.doi.org/10.1146/annurev-psych-113011-143750>.
- Diamond, A. (2014a). Want to optimize executive functions and academic outcomes? Simple, just nourish the human spirit. *Minnesota Symposium on Child Psychology*, 37, 205–232. <http://dx.doi.org/10.1002/9781118732373.ch7>.
- Diamond, A. (2014b). Understanding executive functions: What helps or hinders them and how executive functions and language development mutually support one another. *Perspectives on Language and Literacy*, 40(2), 7-11.
- Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science*, 333, 959–964.
- Dulay, H., & Burt, M. (1977). Remarks on creativity in language acquisition. In M. Burt, H. Dulay, & M. Finocchiaro (Eds.), *Viewpoints on English as a second language*. New York, NY: Regents
- Dweck, C. (2006). *Mindset: The new psychology of success*. New York, NY: Random House.
- Eisenberg, N., Fabes, R. A., Guthrie, I. K., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology*, 78, 136–157.
- Eisenberg, N., Fabes, R. A., Murphy, B., Maszk, P., Smith, M., & Karbon, M. (1995). The role of emotionality and regulation in children’s social functioning: A longitudinal study. *Child Development*, 66, 1360–1384.
- Elmore, R. F. (1993). The role of local school districts in instructional improvement. In S. H. Furman (Ed.), *Designing coherent education policy: Improving the system* (pp. 96-124). San Francisco, CA: Jossey-Bass.
- Elmore, R. F., Fiarman, S. E., & Teitel, L. (2009). *Instructional rounds in education: A network approach to improving teaching and learning*. Cambridge, MA: Harvard Education Press.
- Engle, S. (2015). *The end of the rainbow: How educating for happiness (not money) would transform our schools*. New York, NY: New Press.
- Fisher, A., Godwin, K., & Seltman, H. (2014). Visual environment, attention, allocation and learning, in young children: When too much of a good thing may be bad. *Psychological Science*, 25(7), 1362-1370.
- Frijters, J. D., Barron, R. W., & Brunello, M. (2000). Direct and mediated influences of home literacy and literacy interest on pre-readers’ oral vocabulary and early written language skills. *Journal of Educational Psychology*, 92(3), 466-77.
- Galinsky, E. 2010. *Mind in the making: The seven essential life skills every child needs (NAEYC special edition)*. New York, NY: HarperCollins.
- Glenberg, A. M., Witt, J. K., & Metcalfe, J. (2013). From the revolution to embodiment: 25 years of cognitive psychology. *Perspectives on Psychological Science*, 8(5), 573-585.
- Golinkoff, R. M., & Hirsh-Pasek, K. (2016). *Becoming brilliant: What science tells us about raising successful children*. Washington, DC: American Psychological Association.
- Grant, J. (1993). Questions and answers about multiage programs. In D. Sumner (Ed.), *Multiage classrooms: The ungrading of America’s schools* (pp. 17-19). Peterborough, NH: Society for Developmental Education.

- Gupta, A. (2008). Constructivism and peer collaboration in elementary mathematics education: The connection to epistemology. *Eurasia Journal of Mathematics, Science, and Technology Education*, 4(4), 381-386. Retrieved from <http://proxy.tamu-commerce.edu:9365/>
- Hamre, B. K., Pianta, R. C., Downer, J. T., DeCoster, J., Mashburn, A. J., Jones, S. M., ... & Hamagami, A. (2013). Teaching through interactions. *The Elementary School Journal*, 113(4), 461-487.
- Heckman, J. J.m & Kautz, T. (2012). Hard evidence on soft skills. *Labour Economics*, 19(4), 451-464.
- Hegseth, W. (2017). *Working toward a system observation tool*. Presented at the annual meeting of the International Congress of School Effectiveness and Improvement, Ottawa, Canada.
- Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, 41, 111-27.
- Hogan, D. & Tudge, J. (1999). Implications of Vygotsky's theory for peer learning. In A. M. O'Donnell & A. King (Eds.), *Cognitive perspectives on peer learning. The Rutgers Invitational Symposium on Education Series* (pp. 39-65). Mahweh, NJ: Lawrence Erlbaum
- Ivcevic, Z., & Brackett, M. (2014). Predicting school success: Comparing conscientiousness, grit, and emotion regulation ability. *Journal of Research in Personality*, 52, 29-36. doi: 10.1016/j.jrp.2014.06.005
- Iyengar, S., & Lepper, M. (1999). Rethinking the value of choice: A cultural perspective on intrinsic motivation. *Journal of Personality & Social Psychology*, 76, 349-66.
- Iyengar, S., & Lepper, M. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality & Social Psychology*, 79(6), 995-1006.
- Jackson, P. (1986). *The practice of teaching*. New York, NY: Teachers College Press.
- Jordan, K., & Baker, J. (2011). Multisensory information boosts numerical matching abilities in young children. *Developmental Science*, 14(2), 205-213
- Kampmann, J. & Browne, M. (2011). "Teacher, there's an elephant in the room!" An inquiry approach to preschoolers' early language learning. *Young Children*, 66(5), 84-89.
- Keupp, S., Behne, T., & Rakoczy, H. (2013). Why do children overimitate? Normativity is crucial. *Journal of Experimental Child Psychology*, 116(2), 392-406.
- Kellert, S. R. (2002) Experiencing nature: Affective, cognitive, and evaluative development. In P. Kahn & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural, and evolutionary investigations* (pp. 117-152). Cambridge, MA: MIT Press.
- Kidd, C., Piantadosi, S. T., & Aslin, R. N. (2012). The Goldilocks effect: Human infants allocate attention to visual sequences that are neither too simple nor too complex. *PLoS one*, 7(5), e36399. <https://doi.org/10.1371/journal.pone.0036399>
- Klein, D., & Seligman, M. (1976). Reversal of performance deficits and perceptual deficits in learned helplessness. *Journal of Abnormal Psychology*, 85(1), 11-26
- Kuhl, J. (1985). Volitional mediators of cognition-behavior consistency: Self-regulatory processes and action versus state orientation. In J. Kuhl & J. Beckman (Eds.), *Action control: From cognition to behavior* (pp. 101—128). New York, NY: Springer-Verlag.
- Kutsyruba, B., Klinger, D. A. and Hussain, A. (2015), Relationships among school climate, school safety, and student achievement and well-being: a review of the literature. *Rev Educ*, 3: 103–135. doi:10.1002/rev3.3043

- Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven, CT: Yale University Press.
- Lillard, A. S. (2012). Preschool children's development in classic Montessori, supplemented Montessori, and conventional programs. *Journal of School Psychology, 50*, 379-401.
- Lillard, A.S. (2017). *Montessori: The science behind the genius* (3rd ed.). New York, NY: Oxford.
- Ling, D. S., Wong, C. D., & Diamond, A. (2016). Do children need reminders on the Day-Night task, or simply some way to prevent them from responding too quickly? *Cognitive Development, 37*, 67-72. [Epub 04 Nov 2015 ahead of print] doi:10.1016/j.cogdev.2015.10.003
- Locascio, G., Mahone, E. M., Eason, S. E., & Cutting, L. E. (2010). Executive dysfunction among children with reading comprehension deficits. *Journal of Learning Disabilities, 43*, 441-454. doi: 10.1177/0022219409355476
- Madore, K. P., Addis, D. R., & Schacter, D. L. (2015). Creativity and memory effects of an episodic-specificity induction on divergent thinking. *Psychological Science, 26*(9), 1461-1468. doi: 10.1177/0956797615591863
- Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 244*, 933-938.
- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., ... & Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, 108*(7), 2693-2698.
- Montessori, M. (2000). *The absorbent mind*. Oxford: Clío. (Original work published 1949)
- Pagani, L. S., Fitzpatrick, C., Barnett, T. A. (2013). Early childhood television viewing and kindergarten entry readiness. *Pediatric Research, 74*, 350-55.
- Raven, J. (1994). *Managing education for effective schooling: The most important problem is to come to terms with values*. Oxford: Oxford Psychology Press.
- Rathunde, K. (2014). Understanding optimal school experience: Contributions from Montessori education. *National Society for the Study of Education, 113*(1), 253-274.
- Runco, M. A. (1993). *Creativity as an educational objective for disadvantaged students*. Storrs, CT: National Research Center on the Gifted and Talented. Retrieved from ERIC: <http://files.eric.ed.gov/fulltext/ED363074.pdf>
- Shaul, S., & Schwartz, M. (2014). The role of executive functions in school readiness among preschool-age children. *Reading and Writing, 27*, 749-768. doi:10.1007/s11145-013-9470-3
- Simon, H. (2001). "Seek and ye shall find": How curiosity engenders discovery. In Crowley, K., Schunn, C., & Okada, T. (Eds.), *Designing for science: Implications for everyday, classroom, and professional settings*. Mahwah, NJ: Lawrence Erlbaum
- Smith, A. (1966). *Communication and culture: Readings in the codes of human interaction*. New York, NY: Holt, Rinehart & Winston.
- Sugden, S.G, Kile, S,J, Henderson, R.L, (2006).Neurodevelopmental pathways to aggression: A model to understand and target treatment in youth. *Journal of Neuropsychiatry and clinical Neurosciences 18*(3),302—317.
- Sylva, K., Siraj-Blatchford, I., Taggart, B., Sammons, P., Melhuish, E., Elliot, K., & Totsika, V. (2006). Capturing quality in early childhood through environmental rating scales. *Early Childhood Research Quarterly, 21*(1), 76-92.

- Taggart J, Heise MJ, Lillard AS.(2017) The real thing: preschoolers prefer actual activities to pretend ones. *Developmental Science*;00:e12582.
- Tanner, C. (2008). Explaining relationships among student outcomes and the school's physical environment. *Journal of Advanced Academics*, 19(3), 444-471. Retrieved from <http://journals.prufrock.com/IJP/b/journal-of-advanced-academics>
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with ADD: The surprising connection to green play settings. *Environment and Behavior*, 33(1), 54-77.
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2002). Views of nature and self-discipline: Evidence from inner city children. *Journal of Environmental Psychology*, 22(1-2), 49-63.
- Tomasello, M. (2003a). *Constructing a language*. Cambridge, MA: Harvard University Press.
- Tomasello, M. (2003b). The key is social cognition. In D. Gentner & S. Kuczaj (Eds.), *Language and thought* (pp. 47– 58). Cambridge, MA: MIT Press.
- Tomasello, M., Kruger, A. C., & Ratner, H. H. (1993). Cultural learning. *Behavioral and Brain Sciences*, 16, 495-552
- Turner, J. C. (1995). The influence of classroom contexts on young children's motivation for literacy. *Reading Research Quarterly*, 30, 410–441.
- Vygotsky, L. (1978). *Mind in society: The development of higher mental process*. Cambridge, MA: Harvard University Press.
- Wachs, T. D., & Gruen, G. E. (1982). *Early experience and human development*. New York, NY: Plenum Press.
- Wertsh, J. V., & Tulviste, P. (1990). Apprenticeship in thinking: Cognitive development in social context. *Science*, 249(4969), 684-686.
- West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review*, 51, 355–424.
- Whitescarver, K., & Cossentino, J. (2007). Lessons from the periphery: The role of dispositions in Montessori teacher training. *Journal of Educational Controversy*, 2(2), 11. Retrieved from <http://cedar.www.wwu.edu/jec/vol2/iss2/11>
- Zelazo, P. D., Carter, A., Reznick, J. S., & Frye, D. (1997). Early development of executive function: A problem-solving framework. *Review of General Psychology*, 1(2), 198-226. <http://dx.doi.org/10.1037/1089-2680.1.2.198>