APPENDIX I

NEW YORK STATE PREKINDERGARTEN FOUNDATION FOR THE COMMON CORE

RESEARCH AND SUPPORTING MATERIAL

DOMAIN 1: APPROACHES TO LEARNING

While all of the domains are undoubtedly equal in importance, Approaches to Learning captures the very essence of children: their inclinations, their dispositions, their attitudes, and their personal styles. Approaches to Learning is influenced by such profound constants as gender, temperament, family expectations, and cultural values – constants present at birth and increasingly significant throughout the school years.[2]

Approaches to Learning were formally recognized as a separate and distinct domain integral to the development of children to their full potential almost twenty years ago. In 1989, the National Education Goals Panel (NEGP) was established to help improve the quality of education in the United States. Its very first national goal, "all children will start school ready to learn," prompted the release of Reconsidering Children's Early Development and Learning. This widely accepted and still highly regarded work brought together the input of over 350 scholars on what exactly young children should know and be able to do. To the four domains historically associated with children's development – physical, socio-emotional, language, and cognitive – was added a fifth, somewhat new, domain that required explanation:

Learning styles [how children approach learning situations] are composed of aggregated variables that characterize ways of responding across situations. Learning styles, in contrast to dispositions, are malleable and include variables that affect how children attitudinally address the learning process: their openness to and curiosity about new tasks and challenges; their initiative, task persistence, and attentiveness; their approach to reflection and interpretation; their capacity for invention and imagination; and their cognitive approaches to tasks.[1]

Since then, Approaches to Learning has clearly infiltrated the mainstream thinking of educators. Most State educational agencies that have established early learning standards – what children should know and be able to do before kindergarten entry – have either included approaches to learning as a distinct domain or have folded aspects of it, such as curiosity or persistence, into their standards. Studies of school readiness, and even of later success in school, now specifically address approaches to learning. For example, the nation-wide Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 directly assessed the developmental status of children entering kindergarten across five domains, one of which was approaches to learning.

Since its debut, Approaches to Learning has been regarded as the less well-defined of the domains. As scholars debate and policy makers try to implement, the burning question is, "What does it mean for teachers? . . . for parents? . . . for children?" The answer: teachers and parents must intentionally design learning environments that foster children's natural curiosity, initiative, engagement, persistence, and creativity. The environments must be safe for students to ask questions, to embark on and embrace new tasks, to persevere, and to suggest original solutions. It is absolutely essential that such learning environments are not contrived, but rather, engaging and relevant to the child and reflective of the child's interests.

[2] National Education Goals Panel, 2002.

Learning what motivates each child will help teachers, parents and caregivers support individual differences and help children discover their own learning style.

Curiosity

"Why?" "How come?" "What if …?"

As any caregiver of young children knows, the preschool years are peppered with seemingly endless questions. Preschoolers are curious about themselves, about their relationships with others, and about the worlds they are encountering. But, even before the pre-school stage, children are expressing their curiosity, albeit nonverbally. A new-born visually tracks interesting objects. An older baby "tastes" anything and everything – edible or not – to find out more about it.

Throughout the early years, children's curiosity prompts exploration and experimentation. They take it upon themselves to learn more – by mimicking, questioning – about whatever has piqued their interest. Research shows, in fact, that self-initiated activity "makes it possible for young children to be involved in intrinsically interesting experiences that help them to construct understandings of their world, remain focused during activity, and develop a love for learning."[3] By observing where children's natural curiosity leads them, caregivers can create environments in which children can direct their own learning. Scholars in early education concur that "preschool curriculum is most effective when it takes advantage of children's own interests and curiosity."[4]

Initiative

Whereas curiosity may be a characteristic universal to all children, the degree and manner in which that curiosity is acted upon by each child varies tremendously. Initiative is the willingness to take on tasks or reasonable risks to learn more. Consider, for example, two children playing with race cars. Their pre-school teacher comments "Look at those cars move! What do you think makes them go?" The seed thus planted, one child is content to independently look at a book describing the parts of a car, while another's curiosity isn't satisfied until an adult or peer helps disassemble the car and put it back together again. Both children have taken the initiative to find out more; at the same time, they may have revealed clues to their preferred learning styles – print-oriented and independent in one instance, kinesthetic and small group in the other.

It is easy to fall into assumptions about learning styles based on a child's temperament: "Of course, our print-oriented friend chose a book, he's so shy." And, there is some validity to this connection between personality and approaches to learning. One pilot study of doctoral students used a five factor model (extraversion, agreeableness, conscientiousness, neuroticism, and openness) to explore the relationship between personality and learning. It found statistical evidence that certain personalities adopt either a strategic, surface, or deep approach to learning.[5] However, other research keeps alive the decades-old argument of nature versus nurture. A study of infants' exploration of new objects found that "infants who have spent a lot of time with caregivers who name, show, and demonstrate objects typically spend more time with caregivers and objects together," whereas infants who have not received such interaction will spend more time exploring the objects only.[6]

[3] Hohmann & Weikart as cited in Alabama Performance Standards for 4-year-olds: Alabama's Pre-Kindergarten Initiative, 2004

[4] Bowman, Donovan, and Burns (2001) *Eager to Learn: Educating Our Preschoolers* as cited in Head Start Child Outcomes Framework, Domain 7: Approaches to Learning

[5] Heinstrom (2000). The Impact of Personality and Approaches to Learning on Information Behavior.

This finding provokes thought about how influential familial values and cultural expectations can be on children's initiative. Among different families and cultures, there is a broad spectrum of belief about the role children play in their own learning, whether expected to learn through "observation, imitation, and non-verbal communication," encouraged to actively engage in discussion with children and adults, or regarded as quiet recipients of parents' instruction.[7] In any case, fostering initiative in children can only be effective within the context of both:

The children's temperament – Are there different expectations for different temperaments (e.g., quiet and shy versus people-oriented)?

The style of care they have received – How children are encouraged to learn at home and through their cultural experiences.

Engagement

"Engage," as a transitive verb, means "to obtain and hold the attention of." Transitive verbs express action that is carried from subject to object, such as "To engage her students, the preschool teacher connected the lesson to their holiday celebration." Alternatively, the intransitive meaning of the verb is "to involve oneself," suggesting an internal source of action. "Tamika was so engaged in her play, she lost track of time." For either definition, young children's engagement – in learning, but also in play as a means of learning – is paramount to their development and success.

As noted earlier, self-initiated activity, or learning more about something already of interest, lends itself to a love of learning. It has been noted that "infants and toddlers usually show pleasure when they are successful at manipulating their environment and at overcoming barriers to reach a goal." This prompted at least one early researcher to maintain that young children are motivated to explore their surroundings, overcome obstacles, and master their environment – in other words, to engage.[8]

In the ideal world, all subjects are either so appealing by nature, or presented so appealingly by skillful teachers, that learners' engagement is automatic. Despite educators' best efforts, however, school tasks and activities are not always of intrinsic interest to every child. Learning to engage in challenging or frustrating tasks is an indicator of children's school readiness.

How is engagement encouraged? Start by harnessing the pride and satisfaction children gain from self-chosen play or projects. The natural desire to excel in that which they are interested will propel them to overcome challenges. Point out that hard work and effort, rather than intelligence or luck, powered their success. When this is realized, according to researchers, children become engaged and motivated.[9] When faced with the next challenge – learning something "off the radar" of interest, for example – that sense of accomplishment can be re-invoked.

[6] Wachs and Combs. (1995) as cited in Iowa Early Learning Standards.
[7] NEGP. Reconsidering Children's Early Development and Learning, 1995.
[8] White (1995) as cited in Iowa Early Learning Standards.
[9] Dweck (1999) as cited in Head Start Child Outcomes Framework, Domain 7: Approaches to Learning.

Persistence

Learning how to persevere is not only key to success in school, but an important life skill as well. A recent study found that persistence "is one of the critical elements in successful learning [and] the ability to foster, nourish, and support the development of persistence is a crucial skill set for teachers."[10] When leaders in business were asked about the characteristics needed to guide companies through change, "perseverance" was most often cited.[11]

What does persistence mean for preschoolers? It's maintaining focus on, and investing energy into, a task. It's tuning out distractions and interruptions. It's following a series of steps to create a project. It's knowing when to accept, and when to seek help from an adult or another child when the next step is unclear or too difficult.

As with all of the components associated with approaches to learning, persistence varies among children. This variation may be attributed, in part, to the child's temperament, but other factors have surfaced as being influential as well.[12] Parents and teachers who participated in a longitudinal study of children entering kindergarten reported that "girls persist at tasks more often than boys, older kindergartners persist at tasks more often than the younger, and children not at risk persist at tasks more often than children at risk."[13] Based on the study's definition of "at risk," it appears that persistence can be impacted by the physical (gender), the developmental (age), and the socio-economic status of mothers, particularly single mothers, and/or mothers with less than a high school education.

These findings – that persistence is more than what one is born with – are important for caregivers of young children to understand. Both consciously and unconsciously, parents and early childhood educators are shaping this critical skill. Adults are often overheard expressing encouragement ("Oh, what a beautiful picture you've colored! What can you tell me about it?), but do their actions transmit the same message about persistence? According to researchers Stipek and Greene (2001), "toddlers show more persistence in activities when caregivers promptly respond to their requests for help." If asking for assistance is a signal of a child's desire to persist, it is important that caregivers be responsive to that need. The value of persistence is thereby reinforced.

Creativity

According to Dr. Sharon Lynn Kagan, renowned expert on early learning standards and author of Young Children and Creativity: Lessons from the National Education Goals Panel, "creativity in American early childhood education has often been understood as a focus on specific activities associated with creative expression: art, music, and drama." She goes on to say, however, that today's view of creativity, "embraces it as an approach that encourages invention and problem-solving in all aspects of the curriculum: science, social studies, literacy, and numeracy."[14]

Creativity, then, is the ability to solve problems. It is creating new connections from previous experiences and applying familiar strategies to new situations. Creative learners seek one or more solutions to a problem by actively exploring through trial and error and by observing and interacting with others. This has been observed in children as young as infants.

[10] QIA Motivating Skills for Life Learners to Progress, Persist, and Achieve, 2006.
[11] Kotter, John P. (1996) Leading Change. Harvard Business School Press.
[12] Stipek and Greene (2001) as cited in Iowa Early Learning Standards.
[13] U.S. Department of Education (Fall 1998) Early Childhood Longitudinal Study, Kindergarten Class of 1998-99.
[14] Sharon Lynn Kagan, Ed.D (2003) *Young Children and Creativity: Lessons from the National Education Goals Panel*

For example, when unable to reach a toy at the edge of her blanket, a baby might instead tug on the blanket until the toy is in reach. A three-year-old has discovered something stuck in his cup. Having seen his father pry things out with a screwdriver, the boy proceeds to poke his play drumstick into the cup to loosen the object. Both of these children were creative in addressing the task at hand.

Both children were allowed the opportunity to be creative. Had an adult intervened in either case, by handing the toy to the baby or offering to dislodge the object from the cup, the child would have no need to problem-solve.

It is important for caregivers to recognize naturally occurring opportunities for children to problem-solve and to allow children the autonomy to experiment in those opportunities. As concluded by Piaget, caregivers can encourage problem-solving and can promote creativity "by making problem-solving opportunities available with a wide variety of materials, by encouraging infants and toddlers to experiment with solutions, by not interfering too quickly to solve problems for them, and by helping them notice the results of their experiments."

DOMAIN 2: PHYSICAL DEVELOPMENT AND HEALTH

In all of the ways young children develop, perhaps the most dramatic and probably the earliest observed, is physical growth. New parents are astounded at how quickly their infants grow – on average, tripling in weight and doubling in length during their first year. While that rate does slow somewhat, children are still gaining up to 3.5 inches in height, per year, when they enter kindergarten. [15] Furthermore, the first five years mark an amazing transformation in children's bodies. Their bones, muscles, joints, nerves, and synapses learn to work together to produce that first smile, that first "DaDa," that first step – before long the baby is an independent preschooler riding a tricycle.

Information about children's physical milestones is abundant. At wellness visits, pediatricians talk in percentiles, comparing the height and weight of the patient to his or her peers. Women, Infants, and Children programs provide information and resources on what constitutes healthy growth to the parents who receive their services. Numerous books, pamphlets, and internet sites feature descriptions of children's ages and expected abilities. Even well-meaning grandmothers are happy to share their opinion on the best age to toilet-train. If parents and caregivers somehow escape this deluge of information, it is nonetheless inevitable that they will – on their own – notice differences between their children and their playmates. "Why can't my daughter form letters as well as her friend does?" "Our Johnny connects with the ball every time, but some of his teammates…"

Expectations that derive from comparing children to their peers – whether formally presented in the guise of height/weight percentiles or informally observed during play – can be both valuable and dangerous. At the first sign of deviance from the "normal," it may be natural for parents to hit the panic button and ask, "What's wrong with my child?" In most cases, there is nothing wrong. Children's growth is highly dependent on many factors, such as genetic potential, quality of prenatal care, and overall nutrition. To expect "by the-book" growth at every checkpoint is unrealistic. On the other hand, repeated occurrences of slower-than-expected growth or patterns of failing to meet physical milestones may be cues for investigating further into possible causes, such as infections or chronic disease, psychosocial health, growth hormone deficiency, and other disorders.[16]

[15] M.J. Hockenberry and D. Wilson (2007) "Nursing Care of Infants and Children (8th Ed.) St Louis: MI, Mosby Elsevier

Many children with delayed growth can also have delays in other areas of development, so it is important to rule out metabolic problems.

It is also important to consider the impact that physical development has on learning. As coordination improves and bones grow, children can undertake increasingly complex physical endeavors. They learn to roll over, to scoot or crawl, to walk, to run, and so on. They progress to the next level of complexity when their bodies are able to support that level. Children learning to write, for example, go through distinct stages based, in part, on physical ability. Scribbling is often recognized as an important precursor to writing, but the process of learning to write actually begins far earlier than the first time the child puts crayon to paper. Being able to hold that crayon requires the fine-motor skill of coordinating index finger and thumb. By their first birthday, babies demonstrate this "pincer grasp" by picking up small objects like cheerios. But, babies are progressing toward this skill from as early as six months, when they pick up large objects by pushing their whole hand over a toy and curling their fingers around it. [17]

Between three and four months, babies begin developing the gross-motor skills that will eventually allow them to control a pencil, which "depends on stability of the shoulder and arm."[18] Babies strengthen their shoulders and arms every time they push up to raise their heads and shoulders during "tummy-time" and later, when they begin crawling. Crawling also reinforces the ability to cross the body's midline, developing directionality, an important skill for writing left to right.[19] Remarkably, even the act of gazing into babies' eyes helps them learn to focus their vision, which develops into the eye-hand coordination necessary for forming letters. Proper sensory development, then, is also integral to the multifaceted process of writing.

Placing objects within reach, providing plenty of tummy-time, and interacting one-on-one, eye-to-eye are but a few of the ways that caregivers can promote the fine-motor, gross-motor, and sensory development of children. Perhaps the greatest gift a caregiver can offer, however, is to respect each child as an individual who will develop at a rate unique to him or herself. For each child, there will be abilities, there will be challenges, and there will be supports for those challenges. A child diagnosed with autism may require occupational therapy to address sensory problems. A preschooler struggling with writing may benefit from a pencil grip. It is important that every child, regardless of physical ability or physical challenge, receives the support necessary to not only engage in daily activities, but also to learn.

Teachers' informal observations of the relationship between children's physical well-being and their ability to learn have been confirmed by numerous studies. For example, research shows that children who don't eat breakfast have trouble concentrating at school, becoming restless by late morning as glucose levels, the brain's basic fuel, drop. This news is made more troubling by a finding in a Carnegie Foundation Report (1990) in which more than half of the teachers surveyed stated that poor nourishment is a problem at their school. Furthermore, "children who suffer from poor nutrition during the brain's formative years score much lower on tests of vocabulary, reading comprehension, arithmetic, and general knowledge."[20]

[16] U.S. National Library of Medicine and the National Institutes of Health. *MedLine Plus: Delayed Growth*. http://www.nlm.nih.gov/medlineplus/ency/article/003021.htm
[17] Graham, Janice. Wondertime, "Get a Grip". http://wondertime.go.com/learning/article/get-a-grip-pincer-grasp.html (date retrieved : 10/7/09)
[18] Neuman, Susan B., Carol Copple, & Sue Bredekamp. Learning to Read and Write: Developmentally Appropriate Practices for Young Children (2000) National Association
[19] Shamberg, Shoshana. Preparing Mind and Body for Childhood Development. Simple sensory motor strategies for childcare providers (2009)

On the other hand, children who do eat a nutritious breakfast not only maintain their attention in late morning, but also display a quicker and more accurate working memory, are better able to perform complex tasks, and make fewer errors in problem-solving activities.[21] It has also been found that regular physical activity can help improve mathematics, reading, and writing test scores, increase concentration, and reduce disruptive behavior, suggesting strongly that the "physical well-being of students has a direct impact on their ability to achieve academically." [22]

How can children be expected to learn if they are depressed, bullied, stressed, or abused? The National Association of State Boards of Education perhaps summarizes it best: "Health and success in school are interrelated" (1998). While proper nutrition and physical fitness are key contributors to good health, other factors impacting a child's sense of wellbeing have also been identified. The United States Department of Education's belief that "[t]oo many of our children start school unready to meet the challenges of learning, and are adversely influenced by… drug use and alcohol abuse, random violence, adolescent pregnancy, AIDS, and the rest," is backed by both state and federal mandates for tobacco-free buildings, drug- and gun-free zones, immunization requirements, and the 2004 Child Nutrition Reauthorization Act.[23,24] The American Cancer Society maintains that children "who face violence, hunger, substance abuse, unintended pregnancy, and despair cannot possibly focus on academic excellence. There is no curriculum brilliant enough to compensate for a hungry stomach or a distracted mind."[25]

DOMAIN 3: SOCIAL AND EMOTIONAL DEVELOPMENT

Historically, the quality of many educational systems has been determined by measures of reading, writing and mathematics. Standardized tests and screening devices may well capture the extent to which students – whether incoming kindergartners, fourth-graders, eighth-graders, or high school graduates – can understand and express ideas or compute figures, but many such tests are less able to portray "non-academic" skills that are the keys to success in school and in life. It is imperative that individuals are able to form positive relationships with others, for it is those relationships that give meaning to their experiences in the home, in school, and in the larger community.

In this increasingly globalized and shrinking world, ensuring the healthy social and emotional development of preschoolers is now more critical than ever. Preschool children must learn to be aware of and comfortable with themselves and others and to recognize and manage their emotions. At this age, engaging in respectful two-way interactions with adults is as important as forming positive relationships with peers. Children should demonstrate trust with familiar adults and cooperation with their peers. They must also know when to seek guidance from adults and how to problem-solve with their peers and independently. It is with these skills that children will be best prepared to self-regulate and adapt to new situations.

[20] Brown, L and Pollitt, E. 1996 "Malnutrition, poverty, and intellectual development." as cited in Action for Healthy Kids. "The Role of Sound Nutrition and Physical Activity in Academic Achievement."
[21] Dairy Council of California. "Good Nutrition: The First Step in Getting Kids Ready to Learn." (1997)
[22] Shephard, R.J. 2008 "Curricular Physical Activity and Academic Performance" as cited in Action for Healthy Kids. "The Role of Sound Nutrition and Physical Activity in Academic Achievement."
[23] United States Department of Education. "America 2000: An Education Strategy Sourcebook" as cited in Association of State and Territorial Health Officials (ASTHO) and the Society of State Directors of Health, Physical Education and Recreation (SSDHPER). "Making the Connection: Health and Student Achievement." 2002
[24] Marx, E., Wooley, S., and Donica, B. "A Coordinated Approach to Health and Learning." The Healthy Child. Vol 85, No. 3. Jan/Feb 2006. Retrieved 5/28/08 from www.nawsp.org/ContentLoad.do?contentId=1788&action=print
[25] American Cancer Society. "*National Action Plan for Comprehensive School Health Education*" as cited in Association of State and Territorial Health Officials (ASTHO) and the Society of State Directors of Health, Physical Education and Recreation (SSDHPER). "Making the Connection: Health and Student Achievement." 2002

Dr. Edward Zigler, renowned child development expert and one of the architects of Head Start, writes:

> "…cognitive skills are not the sole determinant of how successful a child will be in school or in life. Nor does intelligence develop independently of social-emotional and other systems of human development. Think about the not-so-simple task of learning how to tie a shoe. A child must have the cognitive ability to memorize the steps involved and their order, the fine motor skills and eyesight needed, and the motivation to want to learn the task and to keep trying until he or she succeeds."[26]

The measure of social and emotional development has long been the "missing piece" of intelligence testing. Alfred Binet, creator of the first modern intelligence test and so-called "father" of IQ testing, cautioned that his scale was designed to identify children who should be placed in special schools where they would receive more individual attention, not to serve as a definitive statement of a child's intellectual capacity. He, in fact, argued:

> ". . . in intelligence, there is a fundamental faculty, the alteration or the lack of which, is of the utmost importance for practical life. This faculty is judgment, otherwise called good sense, practical sense, initiative; the faculty of adapting one's self to circumstances. Indeed the rest of the intellectual faculties seem of little importance in comparison with judgment."[27]

David Wechsler, creator of the Wechsler Adult Intelligence Scale (1939), Wechsler Intelligence Scale for Children (1949), and the Wechsler Preschool and Primary Scale of Intelligence (1967), believed that intelligence is "the global capacity to act purposefully, to think rationally, and to deal effectively with [one's] environment."[28]

These early allusions to social and emotional dimensions of child development were formally presented by Howard Gardner in his groundbreaking work on multiple intelligences. He argued that interpersonal intelligence (the capacity to understand the intentions, motivations and desires of other people) and intrapersonal intelligence (the capacity to understand oneself, to appreciate one's feelings, fears and motivations) were as important as the cognitive types of intelligence traditionally measured by IQ tests.

That social and emotional skills are integral to the holistic development of children and to their success in pre-school, as well as in later schooling, has been confirmed by many studies.

In separate studies, researchers established young children's social status (a proxy for social and emotional skills) in very early grades as highly predictive of social and academic performance in the third grade[29] and of school success and mental health adjustment in adolescence.[30]

[26] Zigler, E., Gilliam, W. S. and Jones, S.M., 2006 A vision for universal education. New York: Cambridge Press
[27] Plucker. J.A. (Ed.) (2003). Human Intelligence: Historical influences, current controversies, teaching resources. Retrieved 10/7/09 from http://www.indiana.edu/~int.
[28] Cited in Kaplan & Saccuzzo, Psychological Testing: Principles, Applications, And Issues (2008) Wadsworth Publishing Company. p. 256
[29] Wasik, B.H. 1997. Kindergarten predictors of elementary children's social and academic performance. In *Influences on and Linkages between Children's Social and Academic Performance: A Developmental Perspective*. B.H. Wasik, chair. Symposium conducted at the annual meeting for Social Research in Child Development, Washington, D.C.
[30] Lynch, M. and D. Cicchetti. 1997. Children's relationships with adults and peers: An examination of elementary and junior high school students. *Journal of School Psychology* 35 (1): 81-99.

Raver found that children who are emotionally well-adjusted have a greater chance of early school success.[31] In another study, she and Zigler found that children who are able to build positive relationships with others have a greater chance of academic success.[32]

Joseph and Strain found that problem behaviors decrease and social skills improve when children are taught to understand their own and others' emotions, handle conflicts, problem-solve and to develop relationships with others.[33] This is particularly important for children whose life circumstances may prompt them to be labeled "at-risk." Several "risk factors" have been identified as possible inhibitors of a child's ability to meet society's standards for behavior, including homelessness, maternal depression, abuse, exposure to violence, and negative values in the school or neighborhood. Children who are living with four or more these factors are more likely to have social-emotional difficulties.[34]

Reporting on a series of studies of preschoolers, Rubin and Coplan found that children who were non-social or withdrawn during preschool were more likely to suffer from peer rejection, social anxiety, loneliness, depression, and negative self-esteem in later childhood and adolescence. Negative implications for academic success were also suggested.[35]

The impact of healthy social and emotional development remains strong past the preschool years, extending perhaps to adulthood. A study of over 280 programs addressing "social-emotional learning" (SEL) found that students who receive instruction on recognizing and managing emotions, understanding and interacting with others, making good decisions, and behaving ethically and responsibly experienced an increased 11-percentile-point achievement gain in comparison to students who do not participate in SEL programs.[36] Successful leaders in today's corporate world rely on social and emotional competencies for effective communication, sensitivity, initiative, and interpersonal skills. Economics Nobel Laureate James Heckman notes that the most effective interventions take place during and prior to kindergarten, and that investing in social-emotional skills is a cost-effective approach to increasing the quality and productivity of the workforce through fostering workers' motivation, perseverance, and self-control.

In an analysis of early childhood education research, the Northwest Regional Educational Laboratory (NWREL) confirmed the lifelong influence of social and emotional development. The numerous longitudinal studies reviewed in the analysis showed that children who graduated from preschool, as compared to those who did not participate, generally had a greater degree of success in later schooling and in life. (See Chart A). Indeed, NWREL found "it is in the non-cognitive realm that the greatest benefits of preschool experience occur."

31 Raver, C.C. 2002. Emotions matter: Making the case for the role of young children's emotional development for early school readiness. *SRCD Social Policy Report, XVI* (3). Ann Arbor, MI: Society for Research in Child Development. Http: www.srcd.org/spr.html.
32 Raver, C.C. & Zigler, E.F. 1997. Social competence: An untapped dimension in evaluating Head Start's success. *Early Childhood Research Quarterly*, 12, 363-385.
33 Joseph, G.E. & P.S. Strain. 2003. Comprehensive evidence-based social-emotional curricular for young children: An analysis of efficacious adoption potential. *Topics in Early Childhood Special Education*. 23 (2):65-76.
34 Bowman, B. 2006. School readiness and social-emotional development. In B. Bowman & E.K. Moore (Eds.) *School Readiness and Social Emotional Development: Perspectives on Cultural Diversity*. National Black Child Development Institute, Inc.
35 Rubin, K. & R.J. Coplan. 1998. Social and nonsocial play in childhood: An individual differences perspective. In O.N. Saracho & B. Spodek (Eds.) *Multiple perspectives on play in early childhood.* (pp. 144 – 170). Albany: State University of New York Press.
36 Durlak, J.A., Weissberg, R.P., Dynmicki, A. B., Taylor, R.D., Schellinger, K.B. *The impact of enhancing students' social and emotional learning: meta-analysis of child-based universal interventions.* Child Development (in press).

Chart A: Task-related, Social, and Attitudinal Outcomes Associated with Preschool Participation	
fewer referrals for remedial classes or special education	lower incidents of illegitimate pregnancy, drug abuse, and delinquent acts
less likely to repeat grades	higher employment rates and better earnings
less often absent or sent to detention	
greater academic motivation, on-task behavior, and capacity for independent work	fewer arrests and antisocial acts
	better relationships with family members
	higher incidence of volunteer work
more positive attitudes toward school	better self-esteem and a greater locus of control
more frequent high-school graduations or GED completion	

Cotton, K. & Conklin, N.F. 2001. *Research on Early Childhood Education. Topical Synthesis #3 of the School Improvement Research Series.* Northwest Regional Educational Laboratory. http://www.nwrel.org/scpd/sirs/3/topsyn3.html

It is already clear that social and emotional development is paramount to success; it is becoming clearer that such development requires cultivation. The ability to get along with others, to recognize one's own strengths, to adapt, and to self-regulate are not merely natural by products of children maturing and interacting with peers; they are a learned skill set. Increasingly, early educators are finding that children are very much in need of this type of learning. Social-emotional development has been cited by many states as the area in which children are least prepared for kindergarten, and the number of kindergarten-aged children who are considered not "ready to learn" has been reported to be as high as fifty percent.[37] More troubling still, it has been estimated that between 16 and 30 percent of children entering kindergarten have emotional or behavioral problems that pose ongoing problems to teachers.[38] Researchers have also reported that forty percent of children in a Head Start program exhibited problem behaviors (such as kicking or threatening others) at least once a day.

[37] Rimm-Kaufman, S.E., Pianta, R.C. and Cox, M.J., 2000 *Teacher's judgement of problems in the transition of kindergarten.* Early Childhood Research Quarterly, 15 (2, 147-166).
[38] National Center for Children in Poverty. 2002. Building Services and Systems to Support the Healthy Emotional Development of Children: Promoting the Emotional Well-being of Children. Volume 12: No. 3 NCCP

How do early educators address these problems? Bodrova and Leong have suggested that the fourth "r" teachers must attend to – along with readin', writin', and 'rithmetic – is regulation. Self-regulation has two dimensions: the ability to control one's impulses (not grabbing a coveted toy from a peer's hands) and the capacity to do something because it's needed (asking to play with the desired toy and then waiting one's turn). According to Bodrova and Leong, self-regulation is used in both social interactions and in thinking, providing the research-based example of having to

The Teaching Pyramid

overcome the desire to focus on the picture of a dog when reading its caption of "cat." Children's self-regulation behaviors in the early years are regarded by researchers as more predictive of school achievement in reading and math than their IQ scores. [39, 40]

Critics seeking to minimize the role of self-regulation in a child's development may argue that such behavior can only occur when the child is physiologically ready. There is some truth in this argument, as brain research does indicate that the ability to regulate is tied to the development of the prefrontal cortex, which is also important to controlling one's emotions and focusing one's attention.[41] However, it has also been proven that those necessary neural pathways are constructed and strengthened by positive interactions with others. [42, 43]

One model for promoting the social and emotional development of all children in the classroom extends to teachers the power of positive interactions with others. As depicted in the diagram, the Teaching Pyramid builds upon a base of "positive relationships with children, family, and colleagues." This model urges teachers to focus on their relationships with children and families and to include developmentally appropriate, child-centered classroom environments that promote children's developing independence, successful interactions, and engagement in learning. Such nurturing and responsive caregiving will address the social and emotional needs of most children. For those children whose challenging behavior indicates that these "universal practices" are not adequately addressing their social/emotional status, teachers can reframe the problem behavior into a skill-learning opportunity. The desired behavior is modeled for the child, practiced by the child, and maintained in both familiar and new situations.[44]

[39] Bodrova, E. & D Leong. 2008. Developing Self-Regulation in Kindergarten – Can We Keep All the Crickets in the Basket?

[40] Blair, C. 2002. School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist* 57 (2):111-27.

[41] Blair, C & RP Bazza. 2007. Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development*. 78 (2):647-63.

[42] Brodrova, E. & D. Leong. 2005. Self-Regulation as a Key to School Readiness

[43] Eisenberger, N.I., Taylor, S.P., Gable, S.L., Hilmert, C.J., Lieberman, M.D., 2007, *Neural pathways link social support to attenuated neuroendocrine stress responses.* NeuroImage, 35, 1601-1612. [49]

[44] Promoting Children's Social and Emotional Development through Preschool Education; Crockenberg, S. & Leerkes, E. 2003. Infant negative emotionality, caregiving, and family relationships. In A.C. Crouter & A. Booth (eds.). Learning to Read the World: Language and Literacy in the First Three Years. (pp. 557-78). Mahwah, NJ:Erlbaum

Lest educators be overwhelmed by a "fourth r," it is important to remember that fostering social and emotional development should occur within the context of everyday life. Of course, there are plenty of "teachable moments" – when Ben punches Denzel for stealing the ball, when Grace blurts out the answer to the question addressed to Taritha. But, in a more positive approach, the childhood act of play needs to be taken seriously as a very real avenue to social and emotional development. For it is through "activities in which children – and not adults – set, negotiate, and follow the rules" that pre-schoolers are best able to access one of the important gateways to success: self-regulation.[45], [46]

DOMAIN 4: COMMUNICATION, LANGUAGE AND LITERACY

Communication, in its purest form, is neither the telephone nor the computer; it is the ability "to express oneself in such a way that one is readily and clearly understood." Evolving technology: cell phones, instant messaging, email, and teleconferencing has seemingly propelled us into an age of telecommunication, one in which our messages can be instantaneously shared through speech, text, graphics, and video.

The ability to express oneself is displayed from the moment children are born. When infants cry, they are conveying a need arising from hunger, discomfort, pain, or distress. Parents and other caregivers are often soon able to detect exactly what the baby wants by the distinctive sound of the cry. Young babies may also communicate feelings of displeasure by hiccupping, yawning, stretching

out their arms, grimacing, or even falling asleep.[47] As early as six weeks, babies begin to express their contentment by cooing, making squeals, gurgling, and even making vowel sounds such as "ah-ah."[48] At around this same time, babies exhibit their first "real" smiles. Although parents often notice their baby smiling earlier – perhaps while sleeping or staring at a picture, those smiles are regarded as spontaneous, not requiring "the complex thought process of a social smile. One of the most special things about the social smile is that it opens up a whole new way of communicating with your baby."[49]
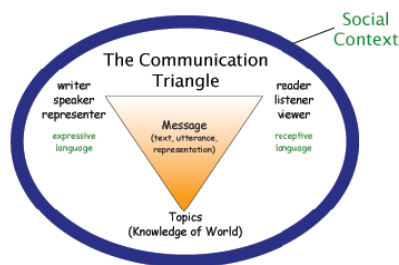
This connection between baby, parents and/or caregiver sets the stage for the "dance" of communication, a dance that becomes increasingly intricate as very young children acquire language. Daniel J. Siegel, a leader in the field of attachment and parenting, has proposed the idea of "contingent communication," in which the mind of one person joins the other. Basically, the child sends a need. The parent perceives the need, interprets the need, and responds promptly and sensitively to it. Babies learn that they can rely on their parents' responsiveness, thereby forming a secure attachment to the parent. Research by Shonkoff and Phillips indicates that infants whose parents respond appropriately and consistently to their efforts to communicate are more advanced on virtually all assessments of

[45] Fox, L. & R.H. Lentini: 2006. "You got it!" Teaching social and emotional skills. *Beyond the Journal.* National Association for the Education of Young Children.
[46] Zigler, E.F., Singer, D.G. and Bishop-Josef, S.J.: 2004 *Children's play: The roots of reading.* Washington D.C., Zero to three.
[47] Reinhartsen, D. & P. Pierce, P. (no date) Developing communication abilities." In *Baby Power: A Guide for Families for Using Assistive Technology with their Infants and Toddlers*, ed. P. Pierce. Chapel Hill, NC: The Center for Literacy and Disabilities Studies, University of North Carolina at Chapel Hill. Retrieved 6/6/08 from www2.edc.og/ NCIP/LIBRARY/ec/Power_7.htm
[48] Papalia, D. & S. Wendkos Olds. 1987. *A Child's World: Infancy through Adolescence*. Fourth Edition. New York: McGraw-Hill Book Company. 50
[49] *Smiling: What Experts Say*. Retrieved 6/6/08 from http://family.go.com/parentpedia/baby/milestones-development/baby-smiling/

developmental and cognitive status.[50] It has also been noted that mothers with securely attached children of preschool age tend to read more and give more reading instruction than mothers with children who are less securely attached, again suggesting the interactive nature of communication and of language development.[51,52]

That language exists within a social context is not a new idea. In his book, Closing the Circle: A Practical Guide to Implementing Literacy Reform, K-12, author Sean Walmsley traces the roots of what is known as the "communication triangle" to Aristotle. The communication triangle "represents the basic relationships among those who create and express ideas (writers, speakers, and representers), those who receive and make sense of them (readers, listeners, and viewers), the topics or ideas themselves, and the actual text. All of these interactions lie within a social context that influences – in some cases, controls – these interactions."[53]

The terms "expressive language" and "receptive language" used in the diagram of the communication triangle have long been used in the study of language acquisition (and are defined below), but the listing of "representer" and "viewer" in their respective categories may be unexpected. To represent is to express ideas in a variety of media. Representing can be regarded a precursor to writing, but interestingly, writing is also one of the many forms of representing. Likewise, children "view" before they are able to read, yet the ability to make sense of what they observe will carry through as a necessary life-long skill in an increasingly visual world. That young children express themselves before knowing how to write, and acquire knowledge before knowing how to read convinces Walmsley that representing is indeed a critical and first component of expressive literacy, viewing a critical and first component of receptive literacy.[54]

If communication is the ability to express oneself, and language is one way in which to do so, what then, is literacy? Traditionally, literacy has meant the ability to read and write, but experts agree that it is much more than that. Since the mid-twenties when the concept of "reading readiness" was introduced, to the early 1970's when noted educator and researcher, Marie Clay, challenged reading readiness with the new idea of "emergent literacy," to Walmsley's present-day argument that viewing and representing are critical components, literacy has come to include a continuum of those early behaviors that lead to actual reading and writing.

Much research confirms the validity of this model. Teale and Sulzby found that literacy development begins before children participate in formal education and other researchers have identified contributors to that development.[55] According to Logue, "nothing is more important [to developing literacy skills] than regular, daily experiences of face-to-face interactions – being read to, talked to, listened to, touched, and comforted."[56] Studies by Purcell-Gates, McGee, Lomax & Head, and Neuman & Roskos found that interacting with print or seeing print on a day-to-day basis helps children learn about written language

[50] Shonkoff, J. and D. Phillips. 2000. *From Neurons to Neighborhoods*. Washington, D.C.: National Academy Press.
[51] Bus, A.G. and M.H. van Ijzendoorn. 1995. Attachment and early reading: A longitudinal study. *Journal of Genetic Psychology* 149: 199-210.
[52] Bus, A.G. and M.H. van Ijzendoorn. 1988. Mother-child interactions, attachment and emergent literacy: A cross-sectional study. *Child Development* 59: 1262-1273.
[53] Walmsley, S. 2008. *Closing the Circle*. San Francisco: Jossey-Bass. pg. 7
[54] Walmsley, S. 2008. *Closing the Circle*. San Francisco: Jossey-Bass.
[55] Teale, W. and E. Sulzby. 1986. *Emergent Literacy: Writing and Reading*. Norwood, NJ: Ablex Publishing Corporation
[56] Logue, M.E. 2000. *Implications for Brain Development Research for Even Start Family Literacy Programs*. Washington, D.C.: United States Department of Education.

and reading, even if they do not already read.[57, 58, 59] Nursery rhymes and rhyming, singing, and word games all promote linguistic awareness, which leads to phonemic awareness.[60, 61] Inventive spelling – when young children attempt to spell a word based on what they hear in the word – appears to Clarke and Ehri to be a step toward alphabetic knowledge.[62, 63]

These studies and many others over decades of research prompted the National Early Literacy Panel to identify characteristics of children, birth to age five, that were most closely linked to later literacy achievement: oral language development, phonological/phonemic awareness, alphabetic knowledge, print knowledge, and invented spelling. Furthermore, the Panel recommended the inclusion of high-quality early language experiences as a means to enhance young children's development.[64] The National Reading Council's recommendations for promoting literacy development in young children also includes instruction designed to "stimulate verbal interaction, to enrich children's vocabularies, to encourage talk about books, and to provide practice with the sound structure of words."[65]

Why the heavy emphasis on oral language skills? Research by Tabors and Dickinson shows language development is crucial in preparing pre-school age children for literacy and that word knowledge is closely linked to reading accomplishments.[66] The National Reading Panel credits oral vocabulary as "the key to learning to make the transition from oral to written forms" of communication.[67] From findings of numerous studies, Whitehurst and Lonigan inferred that "children who have larger vocabularies and greater understanding of spoken language have higher reading scores." A study by Larrick of children with limited language exposure, and therefore fewer words in their vocabulary by school entry, revealed that they did not understand sequence of events basic to stories and had difficulty recalling and anticipating the sequence of events in simple stories.[68]

Before they enter school, children may know and use correctly as many as 32,000 words, most of which are learned indirectly by engaging in daily oral interaction (talking with parents and other caregivers, siblings, and peers), by listening to adults read aloud (bedtime stories), and by being actively involved with books (looking at and talking about books).[69] The quality, frequency, and nature of these interactions are influenced by a great number of factors, not the least of which is the socio-economic status of the family. Hart and Risely determined that an average child in a professional family accumulates experience with 45 million words in the first four years of life, compared to 13 million

[57] Purcell-Gates, V. 2000. Family literacy. In *Handbook of Reading Research*, eds. Kamil, M., P. B. Mosenthal, P. D. Pearson, & R. Barr. Vol. III (pp. 853-870). Mahwah, NJ: Lawrence Erlbaum

[58] McGee, L., R. Lomax, & M. Head. 1988. Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behavior* 20: 99-118.

[59] Neuman, S.B. & K. Roskos. 1993. Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal* 30: 95-122.

[60] Bryant, P.E., M. Maclean, L. Bradley, & J. Crossland. 1990. Rhyme and alliteration, phoneme alliteration, phoneme detection, and learning to read. *Developmental Psychology* 26: 429-438.

[61] Maclean, M., P. Bryant, & L. Bradley. 1987. Rhymes, nursery rhymes, and reading in early childhood." *Merrill-Palmer Quarterly* 33: 255-81.

[62] Clarke, L. 1988. Invented versus traditional spelling in first graders' writings: Effects on learning to spell and read. *Research in the Teaching of English* 22: 281-309.

[63] Ehri, L. 1988. Movement in word reading and spelling: How spelling contributes to reading. In *Reading and Writing Connections*, ed. J. Mason & J. Newton. MA: Allyn & Bacon.

[64] International Reading Association. 2005. *Literacy Development in the Preschool Years: A Position Statement of the International Reading Association* Newark, DE: Author. Available at http://www.reading.org/downloads/ positions/ps1066_preschool.pdf

[65] Snow, C.E., M.S. Burns, & P. Griffin, eds. 1998. *Preventing Reading Difficulties in Young Children*. Washington, D.C.: National Academy Press.

[66] Dickinson, D. & Tabors, P. 2001. *Beginning Literacy with Language*. Baltimore: Paul H. Brookes. pp 139-287

[67] National Reading Panel. Undated. Teaching Children to Read: An Evidence-based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction, Reports of the Subgroups. Rockville, MD: National Institute of Child Health and Human Development. pg. 4-3. Available at http://www.nichd.nih.gov/ publications/nrp/upload/report_pdf.pdf

[68] Larrick, N. 1988. *Literacy Begins at Home*. Claremont, CA: Claremont Reading Conference

[69] Voyager U Reading Academy: NYS Reading Resource Center: www.nysrrc.monroe.edu and www.voyagerlearning.com

words for the child from a family receiving public assistance. This is a concrete example of how social context influences the interactions within the communication triangle and how, as suggested by Walmsley, the players can interact in ways that support – or inhibit – growth in expressive and receptive language.[70]

The connection between vocabulary and prior knowledge is especially intriguing. Drawing on background knowledge helps children understand new words; at the same time, new words serve as tools of access to knowledge of the world around and beyond them. This interrelatedness between vocabulary development and background knowledge suggests that what children already know is as important as the new words they acquire. Studies establishing a connection between vocabulary development and literacy achievement have already been mentioned; research on background knowledge and achievement also exists. Robert Marzano, author of Building Background Knowledge for Academic Achievement, cites seven different studies that confirm that "what students already know about the content is one of the strongest indicators of how well they will learn new information relative to the content." [71,72] The significant contribution that background knowledge plays in learning to read prompted the New York State Department of Education to include it in its implementation of Reading First, an intervention strategy that focuses on improving reading instruction. New York State guidelines for scientifically based reading instruction call for a block of systematic and explicit instruction that includes "activating and building background knowledge."[73]

Clearly, cultural and background knowledge, as well as word knowledge, are key contributors to literacy and to communication, but how is such knowledge best cultivated? Again, the strategies are interrelated. Rare or unusual words can easily be introduced within the context of new experiences, which provide information for future ideas and thoughts. Intentionally engaging children in extended discourse – in meaningful conversation – about these experiences will benefit all children, but particularly those who don't naturally interact in meaningful conversation in their day-to-day lives. Snow and Tabors, in their study of low-income elementary children who were experiencing reading difficulties, found that indirect activities, such as frequency of children's outings with adults, amount of time spent interacting with adults, and other enrichment activities, were more closely related to literacy acquisition than direct activities such as helping with homework.[74]

It is perhaps of little surprise that these same activities can serve as tools of assessment. Conversing with students and observing their literacy behaviors are very real means of assessment that can, and should, be used in conjunction with scientific, evidence-based, standardized measures of achievement. In this way, assessment, as a process, can not only help inform policy makers and school districts on what works, but also fulfills its true intent of guiding instruction. This is keenly important in the preschool years, when each student arrives with very different experiences and backgrounds that affect his/her ability to learn.

[70] Walmsley, S. 2008. *Closing the Circle*. San Francisco: Jossey-Bass.
[71] Nagy, Anderson, & Herman, 1987; Bloom, 1976; Dochy, Segers, & Buehl, 1999; Tobia, 1994; Alexander, Kulikowich, & Schulze, 1994; Schiefele & Krapp, 1996; Tamir, 1996; and Boulanger, 1981
[72] Marzano, R. 2004. *Building Background Knowledge for Academic Achievement*. Alexandria, VA: Association for Supervision and Curriculum Development. pg. 1
[73] New York State Education Department. 2005. *New York State Guidelines for Scientifically Based Reading Instruction*. Retrieved July 2008 from http://principalsacademy.monroe.edu/files/NYSGuidelinesReading1stInst ruct.pdf
[74] Snow, C. and P. Tabors. 1996. *Intergenerational Transfer of Literacy*. Commissioned Paper for *Family Literacy: Directions in Research and Implications for Practice -- January 1996* National Symposium. (Available at www.ed.gov/pubs/FamLit/transfer.html).

Receptive Literacy

Receptive language, referred to above, is a component of the more encompassing term "receptive literacy" put forth by Walmsley. Receptive literacy is the ability to understand meaning that originates with others.[75] It is the taking in of information, whether by listening, viewing, or reading. In the first months of life, babies demonstrate receptive language skills when they respond to their mother's voice. Toddlers often recognize logos and understand them to mean a favorite restaurant or activity. Pre-schoolers decipher messages from picture books, and are beginning to pay more attention to print. They may know some words and are starting to make letter-sound associations. As they mature, children are learning how to make sense of what they hear, what they see, and what they read.

A complementary sense of receptive language is the "mental store of words and phrases."[76] As children are repeatedly exposed to a new word, they learn what the word means and how to use it. When this knowledge is securely captured, it is incorporated into the process of building background knowledge to understand more new words and to learn more about the world.

Young children understand more words than they are actually able to produce themselves, partially due to the context in which the message is being sent. In pretend play with food, for example, children may serve food to their adult "customers" who respond, "Oh yum! Doesn't this food taste good? It's so delicious!" While the child understands the connection between "delicious" and something that tastes good, he or she may not use this word until much later. By school age, children use approximately 2,500 words, in contrast to understanding 6,000 and responding to 25,000.[77]

Expressive Literacy

The partner to receptive literacy is expressive literacy, or the ability to create and communicate meaning. If receptive literacy is the taking in of information, so then expressive literacy is the "output" of information through representing, speaking, and writing. As children develop, their ability to express ideas in each of these venues becomes increasingly refined.

Expressive literacy is perhaps easiest to observe through the distinct stages of writing development. Scribbling soon takes the direction of left to right; first letters appear; strings of letters suddenly turn into first "words," words then look like they sound. Before long, and rather remarkably, children are expressing their ideas in conventional writing. Speaking is readily marked, from five-month-old babbling, to toddlers' one-word utterances, to the ensuing explosion of words and phrases, all of which lead to complete sentences by kindergarten entry. Children also express their ideas through their speech.

As a form of expressive literacy, representing warrants further discussion. It may be thought of as what happens before children can speak or before they can write, but it is actually a life-long skill that becomes increasingly sophisticated. Eight-month-babies are representing when they wave bye-bye.

75 Walmsley, S. 2008. *Closing the Circle*. San Francisco: Jossey-Bass.
76 Roskos, K.A., P.O. Tabors, & L.A. Lenhart. 2005. *Oral Language and Early Literacy in Preschool: Talking, Reading, and Writing*. Newark, DE: International Reading Association.
77 Pierce, P. & A. Profio. 2006. From cooing to conversation to *The Carrot Seed*: Oral and written language connections." In *Learning to Read the World: Language and Literacy in the First Three,* eds. Rosenkoetter, S. and J. Knapp-Philo. Washington, D.C.: Zero to Three Press.

Pre-schoolers are representing when they draw or scribble, work with clay, and play "fire-fighter." Older children – fully able to express themselves through speech and writing – continue to represent when they build models, when they illustrate books, when they perform in a school play. At all ages, children communicate understanding through a variety of media.

As the building blocks of literacy– vocabulary, background knowledge, expressive and receptive language, phonological and phonemic awareness, oral expression, the alphabetic principle come together, children learn to view and represent, to listen and speak, to read and write. They become increasingly sophisticated in expressing themselves in ways that are readily and clearly understood. But, true to the communication triangle, this doesn't come in isolation. Pre-school aged children also are becoming increasingly able to interpret and describe in their own words that which others have expressed, whether the moral of a story, the main point of an argument, the feeling of a poem, or the message of artwork. Pre-schoolers are, in fact, perfecting the dance of communication.

The benchmarks and benchmark indicators in this domain represent the standards for what Pre-kindergarten children should know and be able to do in order to be successful learners. Indicators are observable and demonstrative and can be accomplished through the play and active engagement of four year olds within a rich and well-designed environment.

DOMAIN 5: COGNITION AND KNOWLEDGE OF THE WORLD

Scientific research is beginning to reveal information about the physiology of our brains– nerve cells, circuitry, electrical and chemical processes – that is as fascinating as it is complex. Contrary to long-held beliefs that the brain is "hard-wired" at birth, researchers have confirmed it is actually under constant development and that the period of greatest activity is the early years. Interestingly, the brain attains 90 percent of its adult weight by the time a child reaches age five and develops faster than any other part of the body. The enormity of this physical growth aside, perhaps the most compelling finding for teachers and caregivers of young children is how significantly cognitive development can be influenced by environment and experience.

The National Scientific Council on the Developing Child analogizes cognitive development to building a house. The "blueprint" for building a brain is supplied by genetics, but it is the building materials – in this case, proper nutrition, social interactions with attentive caregivers, and absence of toxins – that brings those plans to optimal fruition. In making the house a home, builders modify blueprints to suit the needs of the family; likewise, children's experiences define which neural connections will thrive and which will be discarded. The Council summarizes by stating:

". . . the quality of a child's early environment and the availability of appropriate experiences at the right stages of development are crucial in determining the strength or weakness of the brain's architecture, which, in turn, determines how well he or she will be able to think and regulate emotions."[78]

The brain's architecture is but one aspect of cognitive development. Historically, the term "cognitive development" is most frequently associated with the work of Jean Piaget, who theorized that children

[78] National Scientific Council on the Developing Child. "The Timing and Quality of Early Experiences Combine to Shape Brain Architecture." (February 2008)

move through distinct stages of cognitive growth as the result of an adaptation process involving assimilation and accommodation. His work forwarded the idea of cognition as both the way a child thinks about something and what the child does. Learning is an active process and occurs when children interact in meaningful ways with the world around them.

Other leaders in the field of children's cognitive development also contributed to our current beliefs about how children learn. Lev Vygotsky asserted that interaction with knowledgeable others and culture are important shapers of cognitive development. Drawing from Piaget's model of cognitive stages and Vygotsky's emphasis on interpersonal communication, Jerome Bruner proposed that children's progress through four socio-cognitive stages is facilitated by interaction with adults and peers.

These models of cognitive development have spawned much discussion and unending research. Interestingly, findings have suggested that, contrary to what all three theorists believed, preschool children are capable of higher-order skills, such as hierarchical classification and quantitative reasoning. Armed with sufficient knowledge and/or experience, they can perform activities that might be considered "developmentally inappropriate" for their age or for their development in other areas. In studies by Gobbo and Chi, preschool children who knew a great deal about dinosaurs sorted them by land-living or not, meat-eating or not, etc. Researchers identified knowledge – in this case, of dinosaurs – as the key determinant of whether the pre-school children studied were able to sort by multiple criteria or not.79

Presumably, these young dinosaur "experts" acquired their vast knowledge from their interest in the topic. Parents, teachers, and other caregivers can tap into children's natural interests and their prior knowledge to promote higher-level, abstract, and critical thinking. By facilitating conversation and purposefully asking questions, adults not only provide rich experiences that encourage children to delve deeper into a topic of interest, but also challenge them to reach the next level of thinking – essentially, implementing Vygotsky's strategy of "scaffolding." Open-ended questions, in particular, prompt children to not only use more language, but also require them to recall, and put into sequence, past events.80 In the course of conversation, asking "Why do you think this dinosaur has such a long tail?" will elicit a far greater response than "Isn't this dinosaur's tail long?"

Teachers must be sure to provide age-appropriate opportunities to engage higher-order thinking. During morning hour, facilitate conversation with children about the day's weather, the clothes they are wearing, and the items they brought to school to help them draw conclusions about the four seasons. Ask children to retell – verbally or dramatically – the story behind their own or others' artwork. When reading aloud to a group of four-year-old children, prompt them to predict what will happen to Henny Penny. "Wonder aloud" with children about how life would be different if they were born at a different time or in a different world. For it is through such supportive, questioning, and attentive environments that children will acquire knowledge about language arts and literacy; mathematics; science; fine arts; social studies; and the world.

79 Bowman, B.T., Donovan, S.M. and Burns, S.M. *Editors*; Eager to Learn: Educating our Preschoolers, 2000, p.41.
80 National Scientific Council, Center on the Developing Child at Harvard University. (2007). *The Science of Early Childhood Development: Closing the Gap Between What We Know and What We Do.* Cambridge, MA.

The goal of thinking at a more critical level is infused throughout New York State's learning standards for students in kindergarten through grade twelve. It is equally important for preschool children. It is during these early years that cognitive development and brain development are integrally linked. Young children are able to make sense of their world by acquiring, adapting, practicing, applying and transferring knowledge in order to construct new or expanded concepts. It is through play, active engagement, both linguistically and experientially, experimenting, observing, exploring, manipulating, creating, listening, reflecting, problem solving, and using logic and reasoning that children become capable of more complex thinking.

Cognitive development occurs across all domains and supports children's learning about the world in which they live. This is reflected in the New York State Pre-kindergarten Foundation for the Common Core Some examples of indicators of cognitive development and where they can be found in this document are illustrated below. (Please note: This list is a selected group of examples and is not inclusive of all cognitive indicators.)

Approaches to Learning
Child actively and confidently engages in play as a means of exploration and learning.
Child uses "trial and error" method to figure out a task, problem, etc.

Physical Development and Health
Child uses description words to discuss sights, smells, sounds, tastes and textures.
Child demonstrates awareness of spatial boundaries and the ability to work within them.

Social/Emotional Development
Child understands that other children have needs and rights
Child demonstrates awareness of similarities and differences in habits, traits, preferences, abilities, motives, etc. among his/her family members and/or peers;
Child understands how his/her own emotions impact choices (likes & dislikes).

Approaches to Communication
Child initiates conversations about things around them.
Child uses words, facial expressions, body language, gestures, and sign language to express ideas.

ELA and Literacy
Child demonstrates understanding of the organization and basic features of print.
Child identifies the front cover, back cover and displays correct orientation of book and page turning skills.

Cognition and Knowledge of the World
 Math
 Child will understand the relationship between numbers and quantities to 10.
 Child identifies measurable attributes of objects such as length and weight.

 Science
 Child makes predictions based on background knowledge and previous scientific experience.
 Child identifies cause and effect relationships.
 Child verifies predictions by explaining "how" and "why".

Child makes age-appropriate, logical conclusions about investigations.

Social Studies

Child uses words and phrases that differentiate between events that happen in the past, present and future, e.g., uses phrases like "when I was a baby…" or "before I moved to my new house."

The Arts

Child compares or contrasts different forms of dance and music

Child identifies similarities and differences among samples of visual art.

The sections of the Cognition and Knowledge of the World Domain provide benchmarks and benchmark indicators for specific content areas: science, social studies, the arts, and technology. For Mathematics, benchmark and benchmark indicators are referred to as standards and clusters. Learning environments and instructional practices in early childhood classrooms across settings will be immediately impacted by these expectations. Teachers will be empowered to align curriculum and assessment horizontally across domains as well as vertically to ensure continuity of learning, beginning in Pre-kindergarten. Programs for young children will use these expectations to plan professional development tailored to the needs of individual teachers, as well as, to engage parents in monitoring the progress of their children.

MATH

While walking to the bus stop, Treva counts her footsteps. "One, two, three, four – hey! That's how old I am!" Nodding, her Nana agrees, "You're right! Keep going. What's the next number?" Counting is a skill that many parents and caregivers recognize as being important for their children to have when they enter school, so it is not uncommon for them to encourage their preschoolers to practice. In the everyday context of their lives, however, children are also exposed – perhaps intentionally, perhaps not – to many, many other math concepts.

Math is about numeracy, but it is also about measurement, shapes, and patterns. When a new mark is added to the wall to note the latest growth spurt, children are picking up a sense of measurement, even though no numbers are involved. In fact, this type of math occurs every time a child happily exclaims, "I built the tallest tower!" or complains, "My bag is heavier than hers." The understanding that something is taller/shorter, heavier/lighter, full/empty, and bigger/smaller is a pre-number math concept that paves the way for later understanding of inches, pounds, volume, and mass.

When children notice that their bags are heavier or their towers are taller, they inevitably notice other variables, such as shape. As a math concept for preschoolers, shape and spatial relationships include recognizing and manipulating geometric forms (squares, triangles, circles, rectangles, etc.). Parents and

caregivers may be surprised to learn that correctly using words such as first, last, top, bottom, over, and under can also indicate a child's awareness of spatial relationships.

There are many other math applications hiding within "non-math" activities. What, for example, does clapping have to do with math? The answer: when there is a pattern to the clapping, i.e., teachers sometimes attracts their busy classroom's attention with a "slow clap, slow clap, pause, fast clap, fast clap, fast clap." Detecting patterns help children begin to understand how things work together, which is an important skill for later math development. Counting and measuring activities help children become more familiar with number concepts, equal values and an understanding of

length, height and weight. Opportunities abound for promoting math learning in preschool classrooms.

SCIENCE

Teachers in K-12 classrooms have long struggled with taking the "sigh" out of science. Too often, secondary-school student's associate science with memorizing periodic tables, searching for mystery body parts in formaldehyde-soaked amphibians, and determining whether a rock is sedimentary, metamorphic, or igneous. While the content of this teaching is important, its decontextualized delivery does little to ignite students' interest in the physical properties of the world around them.

Young children, on the other hand, are fueled by an innate curiosity about what works, why it works, how it works, and what's in it that makes it work. Preschoolers are constantly asking, "Why does this rock sparkle?" "How can a frog jump so high?" "What's in water?" When they pose the time-honored, "why is the sky blue?" question, preschoolers are not expecting a detailed explanation of the electromagnetic spectrum but they are purposefully gathering information about, and trying to explain, their observations.

Science is exactly that: a system of acquiring knowledge. This system uses inquiry, observation and experimentation to describe or explain phenomena. For this age group, such activity involves manipulating objects, asking questions, making predictions, developing generalizations, and learning relevant vocabulary. Scientific experiences can occur both formally and informally, but should, as much as possible, allow for hands-on activity with objects and contexts that are meaningful to the child. Teachers may present a lesson on properties of water, but explaining why popsicles drip and ice cubes melt is likely to be more meaningful to children, to have a greater impact on their understanding, and more significantly, to increase their interest in the topic at hand. By exploring the science in the child's everyday world, science is understood not just as the work of chemists, biologists, and geologists, but as an integral and inspiring part of the real life of every child – a powerful message to be learned early and reinforced throughout life.

SOCIAL STUDIES

Today's shrinking globe presents wonderful opportunities for interaction with new people, cultures, and regions. Within these opportunities is a responsibility to appreciate the unique thoughts, beliefs, and actions of the people we meet. On a much smaller scale, pre-schoolers learn to do just that as they venture out of the familiarity of their homes into the community.

When they are very young, children begin to understand their role within their families. They learn the expectations and rules that govern this basic social structure. As they mature, their social circle enlarges to include extended family, friends, neighbors, classmates, teachers, and community helpers. Children soon realize that with new people come new rules, expectations, and ways of interacting.

It is important for children to learn how to navigate the increasing complexity of their social network. Communication and cooperation are tools of navigation that often present themselves naturally between and among individuals with similar perspectives. Reaching out to people with different backgrounds, experiences and beliefs, however, may be less comfortable, therefore requiring additional navigational tools: such as, respect and empathy.

Social studies is understanding one's role within the family and within the community, but also understanding others' roles. How do these roles interact? Older students explore the rights and responsibilities of community members in "Civics" or "Government" classes, but at the pre-school age, the focus is on sharing, taking turns, and practicing being followers and leaders.

Other areas of study traditionally associated with "social studies" are applicable to pre-school as well. History provides a sense of time, including the profound and minute changes that take place over the course of their day, week, or year. To pre-schoolers, this may mean comparing their fall self-portraits to their spring self-portraits. How are the portraits different? What occurred over the course of the school year to explain the difference? This exercise can promote children's grasp of the concept of "then" and "now," but also connect past events to present and future activities.

THE ARTS

Young children engage in pretend play to process their ideas about their world and the people in it. Research findings link dramatic play to children's cognitive, language, and social development, so it is important for caregivers to provide not only props and space, but also unstructured time, encouragement and positive feedback for dramatic play to occur. Fortunately, there are many forms of art through which children can express their thoughts, ideas, feelings, and wishes. Therapists have long used the arts to help children identify and resolve their emotions through media such as drawing, painting, and sculpting. The same is true for music and movement. Exposing children to music, in all its forms, has many benefits for cognitive, physical, social, and emotional development. Experts agree that actively participating in music – whether singing, playing an instrument, or dancing – helps children perform better in reading and math, play more cooperatively with others, control their bodies in space, and build their self-esteem. Even listening to music has its benefits, such as honing a child's ability to detect patterns, which is critical for emergent reading. And, listening to the most basic instrument – one's own voice – can help children distinguish between playground voices, inside voices, whispers, and silence, attributed to strengthening discrimination skills.

TECHNOLOGY

There was a time when preschoolers were well prepared for school if they had a new art smock and a box of crayons. Today, technology is changing the way in which children learn and develop literacy,

math, language, communication, social and problem solving skills. Children must ultimately be prepared to function as knowledgeable, productive, independent, creative thinkers in a technology-based society.

Technology is the systematic application of knowledge, materials, tools, and skills that extend human capabilities. It is a visible part of children's everyday lives and it includes a broad range of tools (computers, telephones, MP3 players, cameras). While important, computers and instructional tools that use computers are only a few of the many technological advances we use today. Technologies developed through engineering include the systems that power our neighborhoods and schools and extend learning in our classrooms. Pre-kindergarten "play" has always included building with blocks, woodworking, playing with water, digging in sand, and molding clay. These activities still make up a part of the preschoolers day but involve a broader understanding of the concepts of engineering and technology. When a child constructs an object with wood and glue or can explain how a see-saw works, he or she is demonstrating an understanding of technology. Technology tools in the classroom (both traditional and digital technology) support a learner-centered and play-oriented early childhood curriculum.

Computers and other digital technology are powerful tools for supporting all learning in the early childhood classroom and can be integrated into classroom curricula, not merely as isolated curriculum components or centers. Children should be taught how to use technology and be

provided opportunities to use it independently or cooperatively as in other learning centers. Computer and digital technology have provided many new tools to assist teachers as a means of supporting educational goals and outcomes.