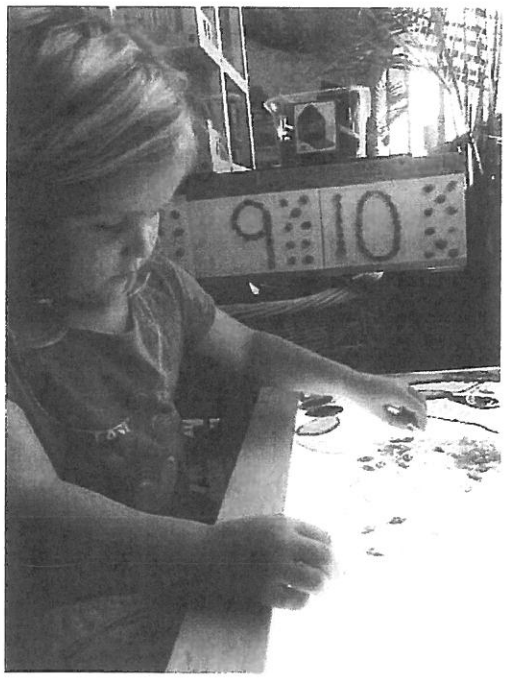
Introduction

When considering the intellectual development of preschool children we must look deeper than simply considering the basic concepts and skills to be included. During this important period of development, the foundations of how and why children learn are being formed and therefore educators must nurture a disposition for learning, explore those concepts which have meaning to the children and encourage children to explore, problem solve, reflect and create.

> "...we must empower children to learn how to learn and enjoy the process. Children will also need many chances to construct their own knowledge. Knowing how to investigate and think is a powerful tool that will stay with them forever."
>
> Stacey, 2011, p.18

High quality early learning programs provide children with opportunities to acquire knowledge that they will build on throughout their lives. When children are engrossed in investigations, their attention is focused on using their senses to explore what is happening, asking questions about what they find and wondering what will happen. Children will benefit from supportive adult participation in the form of well-placed questions and discussion or the addition of simple tools that help to expand and extend children's prior knowledge.

A well-equipped environment that includes a variety of interesting materials, natural items and tools for examining objects and living creatures, appeals to children's inclination to figure out how something works, where it can be used and what can be uncovered in the investigation. With careful planning and ongoing adult support in the context, children enthusiastically engage in learning processes as they discover new concepts and develop deeper understanding of their surroundings, both indoors and outdoors.



By observing to determine what children already understand educators can scaffold their learning with new vocabulary and conceptual frameworks. Through ongoing practice and repeated experiences, children gradually acquire valuable content knowledge.

Guiding Principles and Related Pedagogical Considerations

<u>The Competent Child</u>

- Children's natural urge is to explore their surroundings, equipment and materials, using all of their senses and imagination to help them understand and

talk about their experiences and observations.

- Preschool children raise questions about what they see and how things work as they carefully observe objects, living creatures or events occurring around them and engage in investigations and interactions that help solve their problems.

> "Children who are better at drawing also tend to have larger vocabularies and better pre-literacy skills. Art is a way to communicate (visually) and is linked to these other ways to communicate (through the spoken and written word). Having fun with art experiences can build the foundation for increased competence in many parts of [a] child's life".
> Riley et al. 2009, p148.

Play and Exploration as the Best Mode of Learning

- Play is considered to be an important pathway into inquiry and content. In their play, for example, children engage in exploring the properties of water, in testing and predicting which toys which roll farthest and why, or in constructing a hideaway that can safely accommodate two children.

- Exploration is a process used constantly by young children to 'find out' about the world. They ask questions about how items work, how sounds are made, where creatures live, where oranges come from, or why is the moon in my backyard? Each query invites exploration and investigation as children add to their limited experience, by expanding their knowledge about their environments and the objects in them.

- Exploration of various tools and devices such as measuring tapes, timers, simple scales, graduated measuring cups and spoons lead children to ask questions and use the resources to solve their own problems. These early explorations provide the foundation for more formal mathematical understanding.

Continua of Development: Both Typical and Unique

- As in other domains, children's intellectual understandings develop according to individual and unique patterns of development, in a somewhat predictable manner.

- However, each child's development is influenced by previous experiences and adult support in helping them to make connections as well as with their ongoing play and explorations.

- Adults recognize and respond to each child's strengths, interests, needs and challenges.

Development as Holistic in Nature

- Development in intellectual processes and content is interrelated with other domains as the child grows.

- Social-emotional and language development supports the child's ability to work and interact collaboratively with others in intellectual processes and content. At the same time physical development and spiritual development engage the child in moving about and observing wonderful things to explore in the natural world.

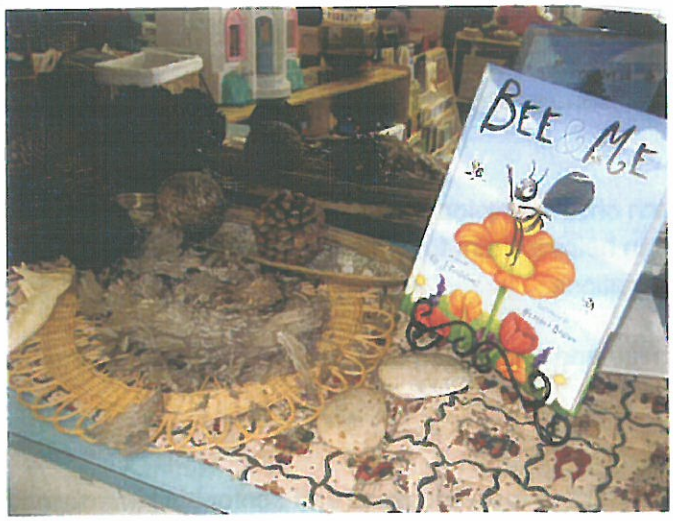
Responding to Children's Interests

- Intellectual exploration is deeply imbedded in classroom activities, projects, and conversations. The environment invites children to share their interests and theories by representing and documenting what they discover.

- Materials, equipment, books and other resources are carefully selected to appeal to children's interests and respond to their questions. Children are encouraged to explore questions such as, "How will the water get into the bucket?" or "What would happen if we loaded the wagon with these rocks?"

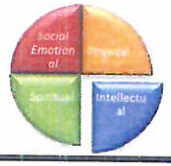
- Ample time for play and exploration is provided to ensure that children have time to try things out, take risks, think about, analyze and reflect on their work. Materials are available over days and weeks so that children can return to explore them on multiple occasions. Children are supported to use materials in ways that adults may not have originally envisioned.

- Children will use materials such as collections of similar objects and other equipment, to incorporate their emerging mathematic and scientific ideas and vocabulary into their dramatic play. Through this playing out of processes and conceptualizations, children expand and deepen their understandings. (Spencer & Hall, 2010; Tomlinson & Hyson, 2012)



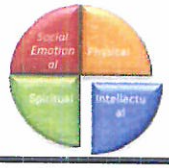
Essential Learning Experience	What does it look like? Continuum of development	Educator Role to assess and support learning and development
Solving Problems • Demonstrating Curiosity • Exploring • Observing • Understanding Cause and Effect • Anticipating and Predicting	***From...*** Exploring materials and observing in an effort to solve problems which are meaningful to the child (likely with varying levels of frustration). Understanding that a certain action will/might cause a specific effect/outcome. Demonstrating curiosity by exploring materials, making observations and engaging with interest in new experiences. Demonstrating curiosity by asking questions about objects and events. ***To...*** Anticipating, predicting and evaluating possible solutions to problems which are meaningful to the child; attempts to solve problem using best prediction Exploring additional solutions or modifying attempts based on observation and experiences if initial attempt(s) are unsuccessful	***Listen...*** Does the child ask questions during discussions/interactions/explorations/field trips? Does the child make connections between stories/books/conversations, and life experiences? Does the child engage in self-talk about problems/challenges or how they might be solved? Does the child anticipate or predict that a certain action or material will/will not suit a particular situation? How does the child express frustration? Does the child verbalize his/her discoveries with others? ***Observe...*** Does he/she notice new materials, examine or sort them, select ones that will suit his/her current task; move materials to another location or project/creative representation and use material in that new location/project/creative representation? How long does the child remain engaged with a task when problems arise? Does the child make multiple attempts to solve the problem? Does the child persist in using one strategy or does (s)he try new strategies after failed attempts to solve a problem? Does the child observe others to identify alternative strategies or use a strategy that has been used previously? Does the child accept input from others to assist in problem solving? Is a child's body language or emotional state indicating frustration. ***Respond...*** Note children's current interests and problems solving; reflect on children's (regular) engagement in particular aspects of play and how/why they use that mode of exploration. Use the dialogue between children as an opportunity to prompt problem solving. Encourage children to reflect on cause/effect/possible solutions to meaningful events in their lives. "Why are there earthworms on the sidewalk? We always see them on the sidewalk when it rains. Why are they on the sidewalk instead of under the ground? I wonder if it is because . . ." Listen deeply to children and encourage them to verbalize and share their discoveries. Use questions beginning with "why", "what", "when", "where" or "how" that prompt children to begin to understand cause and effect as well as to consider other options or ways to view a situation. Provide opportunities for children to **make choices and mistakes** in their learning. Engage with children who are reserved and quiet; observe their actions and **invite them to show** their problem solving strategies.

Creating and Imagining	***From...*** Using materials in simple ways and needing prompting. (dramatic play, visual art, sensory exploration) ***To...*** Using materials in multiple ways to represent ideas and share thoughts or feelings. (dramatic play scenarios, visual art, music, and/or movement, building materials etc.)	***Listen...*** Does the child talk about why (s)he is selecting a particular material or prop? Does the child speak about how a material/prop could be a _____ (blocks could be used as a stove)? Does the child request more of a material or ask where items available previously have gone? Do children ask each other, "Where did you get that?" Does (s)he assign roles such as "I'll be _____ and you can be _____"? Does the child ask/suggest, "Look at this!" "Let's pretend." "Let"s try _____." ***Observe...*** How (with what qualities) does the child pretend to be someone or something on his/her own or when inspired by class activities, prompts or props? (an animal, car, doctor, clouds, etc) How often does the child engage in representing ideas using visual art/construction materials, role play, moving to music, etc.? What aspect of creative expression is the child most often drawn to? (construction, picture making, collage, role play, creating or moving to music, etc.) How does the child use a material to represent something else or use a material for another purpose? Does the child re-enact stories, either familiar or novel, and add his/her own creative aspects or episodes? ***Respond...*** Provide a range of materials that can be used to represent ideas in all areas of the learning environment; change or add materials to prompt expression in a new way based on your observations. Invite children to share their thinking with you by saying, "Tell me about how/what you are building/making/painting etc." Invite the children to suggest materials they might like to use in a specific situation/project. Invite children to share with their peers how they have used specific materials to create an outcome/creative representation/construction/prop/dramatic play, etc.). Use open-ended questions in conversation with children prompting them to think in ways that are divergent and/or convergent. Ask 'what if' or 'what will you do next' questions to prompt children to predict and analyze. Encourage children to consider how they would feel or what they would do or say in various situations (as character in a book, at a community event, or an event experienced by a peer such as falling off a bike and breaking an arm or welcoming a new baby in the family, etc.)



Recognizing Attributes and Characteristics	***From...*** Sorting items by obvious characteristics, possibly with prompting. (cars/blocks/animals etc.) ***To...*** Classifying and comparing materials using subtle differences in attributes. (texture, temperature, size, shapes, living/nonliving, animals that walk/fly/swim etc.)	***Listen...*** Does the child use the vocabulary of attributes related to observable characteristics? (same/different, size, shape, texture, colour, weight, living/non-living etc) Does the child use more detailed attributes? (animals – walking, flying, swimming or jungle, farm, pets; vehicles – combine, seeder, sprayer etc; colours – blue, turquoise, lime green) ***Observe...*** Does the child use attributes to select materials with specific likenesses such as when using cubes, attribute blocks/tiles, paper, manipulatives, and/or dress-ups in creating representations and /or engaging in construction, and/or dramatic play? Does the child identify/sort/classify obvious or subtle characteristics of play materials such as red/yellow/blue buttons (obvious) or buttons with two/four holes (subtle)? Does (s)he notice that some beads in an invitation are big and sparkly while others are small and sparkly; some are some are sparkly dark pink beads and some are sparkly light pink beads? Can the child express the differences or why certain materials were selected? ***Respond...*** Provide multiple opportunities for children to engage with open-ended invitations with materials that involve differences and similarities. Talk about sorting and categorizing in everyday situations and planned activities? Incorporate attribute words into your vocabulary when conversing with children; add more specific words as appropriate. (block/cube/soup can/cylinder; tempera/finger paint, tall/short; big/large/humongous; mad/angry/furious; happy/excited; sad /unhappy; scared/afraid/terrified) Organize class materials in different ways; occasionally, instead of storing markers and crayons in separate containers put all the blue markers and blue crayons in one container; organize paper according to size at one time and later according to colour; organize books in groupings of small/medium,/large instead of by topic; Invite children to determine how materials are to be organized according to attributes. Set up invitations that invite sorting and categorizing or that highlight specific attributes of the materials (simple or more complex)

Exploring Numeracy	***From...*** Reciting simple rote counting (1,2,3) or Recognizing general quantity such as lots/more; little/not very many/not as many Inconsistent identification of number quantities. ***To...*** Using numbers and numeracy concepts to count, measure, and compare materials to add meaning to projects or discover answers to questions identified by the children.	***Listen...*** When/how does the child talk about numbers in play or during daily routines? Do they use number names arbitrarily or do they understand and appropriately name the quantity of small groups of objects/children? (one, two . . . three, four) Does the child recognize that one group of objects is larger than another (cookies on snack plates etc.) and say, "He has more!" etc. In what contexts does the child talk about numbers? Do the child's words indicate that (s)he understands the value/meaning of the number(s)? ***Observe...*** When/how does the child use numbers? How does the child show his/her number knowledge in daily play/explorations? Do the child's actions indicate that (s)he understands the value/meaning of the number(s). In what contexts does the child utilize his/her number knowledge? Does the child apply number knowledge to real life situations? Does (s)he notice numbers in the environment? Has the child moved from exploring numbers to intentional use of numbers (using a cup to fill a bucket rather than a spoon)? Is the child beginning to use number-like symbols/numbers? (when making a price tag for the store; writing on a cheque during role play; identifying numbers on the phone/calculator etc.) Does the child demonstrate an understanding of more/less/equal (or "the same")? ***Respond...*** Model the use of numeracy in one's own everyday life and throughout the learning environment and throughout the day. Prompt the use of counting and one to one correspondence (Three children want to play with the tractors. Are there enough tractors?) Provide props and materials that give purpose to numbers (such as phone books, real life calendars, watches and clocks, calculators, phones, flyers, charts, and graphs, etc) Invite children to explain their use of numbers. Use numeracy vocabulary (numbers, more, less, equal, bigger, smaller) when engaging in discussion with children. Make graphs with children to express preferences, differences, or changes. (use set of class photos to enable children to indicate a choice on a bar graph being created with the children.) Provide opportunities for children to estimate how many, how big etc. Compare the size and weight (bigger/smaller, taller/shorter, heavier/lighter etc) of items in the environment Measure and document items in the environment (block structures, plant growth, children)



Exploring Time	***From...*** Identifying difference of night and day. ***To...*** Understanding basic time concepts that relate to the child's experiences in meaningful ways. (today, tomorrow and yesterday or seasons) Understanding and using sequencing concepts including before, after, first, then, now and later.	***Listen...*** Are children using vocabulary such as day/night/morning/afternoon, today/tomorrow/yesterday, dark/light, winter/spring/summer/fall, first/next/last, before/after, bedtime, using the term "o'clock" although not necessarily with the correct time/number, etc?. Are children making up or singing seasonal songs/retelling seasonal stories? Are children able to identify time of day through identifying signals from their own body? (lunch time because hungry, nap time because tired) ***Observe...*** Are the children using time concepts in their dramatic play? (getting the dolls ready for bed, dressing up to catch the bus to school, doing the dishes *after* eating dinner) Are children observing /enacting/representing seasonal occurrences in their drawings/conversations? (migrating/hatching birds, caterpillars and butterflies, changes in animal coloration, hunting, trapping, planting/harvesting crops, camping, preparing foods for special holidays, etc) Are children using time related materials from experience centres in their play? (clocks/watches/stop watches/timers/calendars/appointment book) Do the children understand the sequence and follow the schedule of the program? ***Respond...*** Document with children the changes in the seasons such as the changing colours of the leaves and grasses or noticing that there is a light skiff of snow/the snow is deeper than it was on our last walk. Take a photo of a particular tree in each season of the year and discuss how the tree has changed through the year. Post a visual schedule and engage the children in talking about first/then/after/next Be intentional in modeling time vocabulary when it is meaningful to the children. For example, you might say, "Good-bye. I'll see you tomorrow! Tomorrow we are going to_____/ Remember after snack we will_____. Have a real calendar in the room and mark important events such as an upcoming field trip, library visits, Elder storytelling, or celebrations that are important to the students in the class (such as Christmas, Chanukah, Eid, Easter, birthdays, etc). Read children's literature which include time concepts (seasonal change, night and day) View and discuss paintings and/or photos that highlight day/night and/or seasonal change with the children about what they observe. Provide opportunities for the children to use various media to create their own original artistic creations. Provide activities that include several steps (long term art project or follow a recipe, create a volcanic eruption with children interested in learning about dinosaurs). Document long term or multi-step projects. Review and discuss the documentation to revisit the progression of the project over time. (Do you remember yesterday when we_____?)

Exploring Position and Direction	***From...*** Demonstrating understanding of basic position and direction concepts. (up/down, on/off, over/under, forward/backward) Using position/direction words ***To...*** Understanding and demonstrating position/direction words in context Demonstrating understanding of complex position and direction words. (beside, behind, in front, on top, near, far away)	***Listen...*** What vocabulary is the child using to describe positions and concepts of direction in play? Is the child using the correct term for the situation? Can the child explain direction and position to peers. ***Observe...*** Are children demonstrating the correct position/direction for the language being used by self or peers? Can the child demonstrate understanding of position/directions using his/her body? Using materials/objects? ***Respond...*** Reinforce position and direction words through children's literature (*Rosie's Walk),* songs (Hokie Pokie), finger plays, games (*Simon Says)*, movement activities. Set up environment/experiences to facilitate understanding of position/direction (gym, outdoors, inside learning environment, overhead projector, light table, blocks, cars and tubes). Be intentional in using position/direction language authentically throughout the day. Take photos of children and/or classroom pets demonstrating various position words (rabbit under a chair, Emma behind the tree). Display photos in the environment and/ or make class books that children can access freely. Ensure a sufficient quantity and variety of building materials are available for the children to create large and small structures in order to develop visual spatial competencies. (position of a block in relation to another such as on top/under/beside/behind; how many blocks are needed to make a structure big enough for ____; recognizing that a particular structure might/might not fit in a particular space) Provide gears, ramps, pulleys etc. for children to explore and manipulate in order to build their experience and knowledge.

References

Baroody, A. (2000), July. Does mathematics instruction for three-to-five year olds really make sense? *Young Children* 55 (4), p. 61-67.

Berkowitz, D. (nd). Oral Storytelling: Building community through dialogue, engagement, and problem solving. In *Teaching Young Children,* 5 (2), p. 10-12.

Copple, C. & Bedekamp, S. (2009). *Developmentally Appropriate Practice in Early Childhood Programs: Serving Children from Birth to Age 8.* Washington, DC: NAEYC.

Copley, J. (2000). The young child and mathematics. Washington, DC: NAEYC.

Dombro, A., Jablon, J. & Stetson, C. (2011). *Powerful Interactions: How to Connect with Children to Extend their Learning.* Washington, DC: NAEYC.

Epstein, A. (2007). *The Intentional Teacher; Choosing the Best Strategies for Young Children's Learning.* Washington, DC: NAEYC.

Gelman, R. & Brenneman, K. (2004). Science learning pathways for young children. *Early Childhood Research Quarterly*, 19, pp. 150-158.

Hewitt, D. (2012). *So This is Normal Too?*(2nd Ed.). St. Paul, MN: Redleaf Press.

NAEYC & NCTM (National Council of Teachers of Mathematics). (2002). *Early childhood mathematics: Promoting good beginnings.* Joint Position Statement adopted April 2002, Washington, DC: NAEYC. Retrieved on July 11, 2012 from www.naeyc.org/about/positions/pdf/psmath.pdf

Riley, D., Carns, M., Ramminger, A., Klinkner, J. & Sisco, C. (2009). *Intellectual development: Connecting science and practice in early childhood settings.* St. Paul, MN: Redleaf Press.

Spencer, C. & Hall, E. (2010). Dramatic play as a context for children's investigation of size and scale. In *Early Childhood Research & Practice,* 12 (2). Retrieved on July 14, 2012,. from http://ecrp.uiuc.edu/v12n2/spencer.html

Stacey, S. (2011). *The Unscripted Classroom: Emergent Curriculum in Action.* St. Paul, MN: Redleaf Press.

Tomlinson, H. & Hyson, M. (2012). Cognitive development in the preschool years. In *Growing Minds: Building Strong Cognitive Foundations in Early Childhood.* (pp. 13-23). Washington, DC: NAEYC.

Recommended Resources

Copple, C. & Bedekamp, S. (2009). *Developmentally Appropriate Practice in Early Childhood Programs: Serving Children from Birth to Age 8*. Washington, DC: NAEYC.

Dombro, A., Jablon, J. & Stetson, C. (2011). *Powerful Interactions: How to Connect with Children to Extend their Learning.* Washington, DC: NAEYC.

Epstein, A. (2007). *The Intentional Teacher; Choosing the Best Strategies for Young Children's Learning.* Washington, DC: NAEYC.

Hewitt, D. (2012). *So This is Normal Too?*(2nd Ed.). St. Paul, MN: Redleaf Press.

Riley, D., Carns, M., Ramminger, A., Klinkner, J. & Sisco, C. (2009). *Intellectual development: Connecting science and practice in early childhood settings.* St. Paul, MN: Redleaf Press.

Stacey, S. (2011). *The Unscripted Classroom: Emergent Curriculum in Action.* St. Paul, MN: Redleaf Press.