

NEVADA'S PRE-KINDERGARTEN STANDARDS

Guidebook for Teachers



Part 2:

Mathematics

January 2007

GUIDEBOOK FOR TEACHERS

MATHEMATICS

Nevada's Pre-Kindergarten Content Standards

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The Nevada Pre-K standards describe appropriate outcomes for children at the end of their preschool experience before entering kindergarten. Therefore, when reading the standards one should think in terms of the child's final learning outcomes before entering kindergarten. The standards are guidelines to be used with all children in any early education setting such as childcare centers, family childcare homes, Head Start, preschools and school district Pre-K programs.

A complete version of Nevada's Pre-K Standards can be downloaded from the Nevada Department of Education website at: <http://www.doe.nv.gov/standards/standprek.html> or a copy can be obtained by contacting Dr. Joanne Everts @ 775-327-5628.

Introduction to Mathematics

Young children are natural mathematical learners (NAEYC and NCTM, 2002). They naturally look for patterns and shapes, make comparisons, and explore relationships within their environment. In early childhood children need to be actively engaged in meaningful and purposeful activities. These activities should make use of children's natural curiosity and need to understand the world around them. Young children should engage in activities that help them develop and use key mathematical concepts, language, and processes. These activities should enable children to expand their understanding of number, shape, size and pattern as it has meaning in the world around them.

Goals of Pre-Kindergarten Mathematics:

- Children develop an understanding of number and number sense.
- Children develop knowledge of spatial concepts, e.g. shapes and measurement.
- Children develop understanding of patterns and relationships.
- Children develop knowledge of sequence and temporal awareness.
- Children develop the ability to use mathematical knowledge to sort, classify, represent, communicate, and solve problems.

To achieve these goals, children's exploration of mathematics should not be isolated, but rather be included in rich, authentic tasks that allow them to integrate new understanding with language development and other developmentally appropriate learning needs. Mathematics is integrated into all aspects of daily routines. Early educators provide these experiences through individual and small-group choices and transitions, and they also allow time for in-depth planned small-group experiences that include interaction, problem-solving and reflection. There must be a strong connection between and among math and literacy and the other content areas. The ultimate goal is to provide children a foundation and the tools to achieve mathematical proficiency in what the National Research Council's "Helping Children Learn Mathematics" (August 2002) outlines and describes as understanding, computing, applying, reasoning, engaging and useful. Each of the pages within the guidebook contains a Pre-K Mathematics standard. The numbers for each standard match the original Pre-K Content Standards document, but may be reworded for the purpose of simplicity.

Mathematical Definitions *

The following is a list of some definitions associated with the mathematical Pre-K Standards. Teachers, parents, and others may find this a useful list when considering specific math concepts included in the guidebooks.

Attribute: a characteristic or feature of an object such as color, size, shape, weight or number of sides.

Classify: sort or form groups by similar characteristics / attributes.

Compare: think about same and different; describe the relationship between two or more objects.

Count with understanding: attach a number name to a series of objects; to understand that the number spoken when tagging or touching the last object also identifies the total number in the group.

Data: information gathered to answer a question.

Estimate: making an educated guess as to the amount or size of something.

Everyday fractions: numbers that represent parts of whole objects in the child's environment (e.g., half a sandwich).

Exploring data: informal experience with data by collecting, organizing, representing and comparing the information.

Extend: continue a pattern beyond what is shown.

Geometry: the area of mathematics that involves shape, size, position, direction and movement and describes and classifies the physical world we live in.

Location: where an object is in space.

Match: to find two objects that have at least one characteristic in common.

Measurable features: a characteristic or attribute of an object that can be quantified (represented with a number) such as size, shape, weight or number of sides.

Measurement: young children's intuitive notions of comparing volume, area, length and other attributes that they will eventually learn to measure; involves decisions about how much or how long.

Number: a unit belonging to a mathematical system used for counting, measuring, ordering and labeling; the meaning of a number word or numeral.

Number and operations: understanding of numbers, ways of representing numbers, relationships among numbers and number systems.

Number sense: the ability to understand numbers, ways of representing numbers and relationships among numbers (Number sense is much more than counting; it involves the ability to think and work with numbers easily and to understand their uses (counting, measuring, ordering and labeling) and relationships.)

Numerals: conventional symbols that represent numbers (e.g., "1" is the numeral for "one").

One-to-one correspondence: linking a single number name with one object, and only one, at a time.

Operations on numbers: basic number combinations and strategies for computing such as addition and subtraction.

Order: arrange objects or numbers to show a progressive increase or decrease of a specific characteristic.

Ordinal numbers: numbers that indicate the position of an object in a sequence (e.g., first, second, third).

Organize: to arrange information in order to see relationships, often using graphs and charts.

Orientation: the position or arrangement of an object.

Pattern: a sequence of colors, shapes, objects, sounds or movements that repeats again and again in a regular arrangement; patterns are a way for young students to recognize order and to organize their world.

Patterns and relationships (algebra): the primary objective is for young children to be able to identify and analyze simple patterns, extend them and make predictions about them.

Position: the place where an object, person, or thing is in relation to others.

Quantity: how many units are in a set (e.g., an amount or the result of counting).

Regroup: to place or assign objects in two or more groups using a different characteristic than was used the first time the objects were grouped.

Relative difference: the specific characteristic that differs among a group of objects (e.g., size).

Rote count: recite the names of the numerals in order or sequence (e.g., singing a counting song).

Sequence: an arrangement of events or actions in a progressive order over time.

Sort: to place or assign objects in two or more groups on a basis of at least one characteristic.

Spatial sense: children's awareness of themselves in relation to the people and objects around them; it includes knowing boundaries, arrangements and positions.

Three-dimensional: objects that have length, width and depth; solid figures such as cubes, spheres and cylinders.

Two-dimensional: objects that have length and width but not depth; shapes such as squares, triangles and circles.

*All definitions were taken from the Missouri Department of Elementary and Secondary Education Pre-K Standards Teachers Guide: Early Mathematics. The following resources were used to obtain the definitions:

Copley, J.V. (2000). *The young child and mathematics*. Washington, DC: National Association for the Education of Young Children.

Fromboluti, C.S., and Rinck, N. (1999). *Early childhood: Where learning begins: mathematics*. Jessup, MD: U.S. Department of Education.

Irons, R.R. (2002). *Growing with Mathematics: Pre-K*. Bothell, WA: Wright Group/McGraw Hill.

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Wolf, D.P., and Neugebauer, B. (Eds.). (1996). *More than numbers: Mathematical thinking in the early years*. Redmond, WA: Child Care Information Exchange.

Children begin to use numbers to show quantity

(Pre-K Standard 1.0)

Numbers, Number Sense, and Computation



Teachers may see children begin to:

Combine and separate groups of objects.

- Put red, yellow, and blue objects together and count them.
- Participate in finger plays, such as “Five Little Monkeys,” that require counting backwards.

Count to 10.

- Rote count to 10 or beyond.
- Count familiar objects or manipulatives in the classroom.
- Count each object once.

Recognize and read some numbers up to 5.

- Use one to one correspondence when counting objects and people.
- Identify and name numbers in signs or books.
- Identify numbers and match number symbols 0-5.

Estimate the amount of objects and check for accuracy by counting.

- Identify the concepts of “more than, less than” when comparing two groups of objects.
- Compare snack with a friend and recognize that they have the same amount.

Match the number of objects to the correct number.

- Identify and match the number to a group of objects.
- Identify the next number in a series of numbers up to 10.

Tips to help children begin to use numbers to show quantity:

- Encourage children to experiment with counting.
- Sing songs that encourage counting.
- Model counting of objects.
- Provide many opportunities throughout the day for counting concrete objects.
- Ask children to answer the question, “how many?” in relation to various concrete objects.
- Play counting games.
- Read books that feature counting or numbers.
- Model the connection between a counting word/number and an object.
- Consistently provide materials to promote counting.

Children begin to recognize patterns and relationships in the environment
(Pre-K Standard 2.0)

*Patterns,
Functions, and
Algebra*

Teachers may see children begin to:

Sort objects by size, shape and color.

- Sort toys by size, color, shape or category.
- Match items that are similar (e.g., sort cars from small trucks).
- Match objects such as pictures of adult animals with their babies.

Recognize and replicate simple patterns.

- Identify patterns that repeat themselves (e.g., red, orange, red, orange).
- Repeat a pattern according to color, size, shape, etc. while using manipulatives or stringing beads.
- Predict what comes next when shown a simple AB pattern.

Compare sets of objects. Determine which has more or less.

- Sort a group of objects more than one way.
- Give reasons for placement of objects in groups.

Tips to help children begin to recognize patterns and relationships in the environment:

- Provide real objects for children to sort, count and pattern with in the classroom.
- Read books to children containing pattern relationships.
- Use transitions as a time to incorporate math concepts (sort children by clothing, gender, eye color, etc.).
- Provide many easy containers for children to sort in (egg cartons or muffin tins).
- Provide opportunities for children to sort, match, and regroup objects on a daily basis.
- Provide sorting materials in various sizes so that children can understand ordinal positions.
- Sing songs that have repeating patterns that children can easily identify.
- Use charts or other posters with recognizable patterns to hang around the room.
- Provide children with opportunities to have many hands-on patterning activities and experiences.
- Encourage children to explore patterns, textures, shapes and graphs in problem solving situations and activities.

Measurement

Children begin to make comparisons and measure.

(Pre-K Standard 3.0)



Teachers may see children begin to:

Compare objects by size to determine smaller and larger.

- Sort toys from smallest to largest.
- Determine which of the children in the classroom is tall, taller and tallest.
- Arrange a group of blocks from longest to shortest.

Sort pennies and nickels.

- Identify and sort pennies, nickels and dimes into categories.
- Understand that each coin represents a certain amount.

Identify day and night.

- Use language associated with everyday events (e.g., it's nighttime because it is dark outside.”).
- Understand the sequence of the daily events and know what will happen next.
- Describe the sequence of activities when going outside to play.
- Tell three events in chronological order.

Tips to help children begin to make comparisons and measure:

- Provide opportunities for children to experiment with measuring (e.g., sand, water, cooking, art experiences).
- Talk about measurement concepts during everyday experiences (e.g., “This table is full of children” “Will this box hold all of these cars?”).
- Provide opportunities for children to estimate about amounts of objects (e.g., how many cups will it take to fill that bowl?).
- Encourage measuring frequently during activity time.
- Talk about time and sequence during daily scheduled events.
- Provide opportunities for children to measure items in the classroom or during outside time. Provide enough rulers, measuring tapes, measuring cups, spoons, etc. for all of the children to experiment with.
- Encourage discussions with children about similarities and differences about objects in the classroom.
- Model descriptive words to express amount or size to children during the daily events.
- Follow a consistent but flexible schedule so that children will learn about the daily sequence of events.
- Provide materials that include three sizes of the same object so that children can explore the differences. (e.g., measuring cups and measuring spoons).



Spatial Relationships and Geometry

Children begin to investigate positions and locations.

(Pre-K Standard 4.0)

Teachers may see children begin to:

Identify circles, triangles, and squares.

- Use basic shapes when drawing pictures.
- Identify circles, squares and triangles in signs or pictures around the classroom.
- Attempt to add shapes to their drawings.

Identify positions such as in front, behind, next to, up, down, inside, outside, or on top.

- Use objects in the class to show positions (e.g., cars on top of, off, inside, below, beside or on top of the blocks).
- Understand the concepts of under, over, beside, between, outside, next to, etc.
- Follow a path or move through an obstacle course.
- Draw a map or the beginnings of a map to show a location during play time.

Tips to help children investigate positions and locations:

- Provide clay or play dough for children to create different shapes.
- Reinforce the use of shapes in the classroom by playing games, singing songs, and reading books about shapes.
- Encourage the children to describe the differences between a pair of shapes. Write down what the children share and post it on shape posters.
- Provide opportunities for children to see many different shapes. If possible, add new shaped blocks to the block area.
- Have children create three-dimensional shapes using a variety of materials.
- Use positional words with an object such as, outside, inside, in front, behind, under, above, beside and on top of to play games with children in the classroom.
- Provide materials so that children will recognize the basic shapes.
- Model language to indicate directions, positions, distances, and sense of order.
- Play shape bingo or I Spy with the shapes that can be found in the classroom.
- Provide puzzles and manipulatives that include a variety of sizes of geometric shapes.

Data Analysis

Children begin to collect, organize, and use information.

(Pre-K Standard 5.0)



Teachers may see children begin to:

Identify and sort data.

- Use data to formulate their ideas (i.e., Take a survey who likes chocolate milk better than white milk).
- Have in-depth discussions about how things are working or how to fix something.
- Talk more in-depth about experiences but may not always be accurate.
- Draw maps with other pieces of information.

Tips to help children begin to collect, organize, and use information:

- Encourage children to use descriptive words.
- Ask children open-ended questions to promote analytical thinking.
- Provide children with materials to make their own graphs, posters and charts.
- Encourage children to share their ideas about how objects work and why.
- Give children time and materials to create their own maps.
- Let children use assorted materials to track their information around the classroom.
- Give the children access to clip boards so that they can collect their own data and information.

Process standards

(Pre-K Standards
6.0, 7.0, 8.0, 9.0)

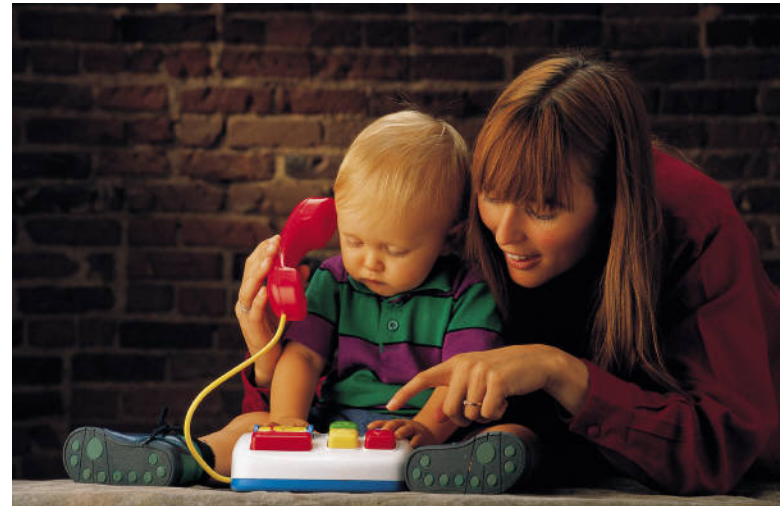
Teachers may see children begin to:

- Apply previous knowledge to new problem-solving situations.
- Explain and verify results.
- Try more than one strategy in problem-solving.
- Apply solutions and strategies from earlier problems to new problems.
- Discuss and exchange ideas about mathematics.
- Use discussion, questioning, research, and data gathering to solve mathematical problems.
- Use pictures to identify mathematical operations and concepts.
- Use physical materials, models, pictures, or writing to represent and communicate mathematical ideas.
- Explain and justify thinking about mathematical ideas and solutions.
- Use everyday language when explaining strategies and solutions to mathematical problems.
- Express mathematical ideas and use them to define, compare, and solve problems orally and in writing.
- Use mathematical notation to communicate and explain mathematical situations.
- Ask questions to reflect on, clarify, and extend thinking.
- Determine relevant, irrelevant, and/or insufficient information to solve mathematical problems.
- Link new concepts with prior knowledge.

Problem Solving, Mathematical Communication, Reasoning, and Connections

*Tips to help children with problem solving,
mathematical communication, reasoning, and
connections:*

- Ask children open-ended questions and help them to problem solve their questions.
- Provide materials for the children so that they may be able to find the answer that they are looking for.
- Encourage children to discuss their thoughts about what they are working on.



Math Resources

Reading is a great way to communicate mathematical concepts to children. It also is a wonderful opportunity to spend time together. You will find most of these books at your local library. Some of these titles are available in Spanish.

Aker, Suzanne. [What Comes in 2s, 3s, & 4s?](#) Simon & Shuster.

Allen, Pamela. [Mr. Archimedes' Bath.](#) Lothrop, Lee, and Shepard Books.

Anno, Mitsumasa. [Anno's Counting Book.](#) Thomas Y. Crowell.

Anno, Mitsumasa. [Anno's Counting House.](#) Thomas Y. Crowell.

Anno, Mitsumasa. [Anno's Hat Trick.](#) Thomas Y. Crowell.

Anno, Mitsumasa. [Anno's Math Games.](#) Thomas Y. Crowell.

Asbjornsen, Peter Christen. [The Three Billy Goats Gruff.](#) Harcourt.

Bang, Molly. [Ten, Nine, Eight.](#) Greenwillow Books.

Barchers, Suzanne and Peter Rauen. [Storybook Stew: Cooking with Books Kids Love.](#)

Bufano, Remo. [Jack and the Bean Stalk.](#) Macmillan.

Carle, Eric. [My Very First Book of Numbers.](#) Philomel.

Carle, Eric. [1, 2, 3 To the Zoo.](#) Philomel.

Carle, Eric. [The Grouchy Ladybug.](#) Philomel.

Carle, Eric. [Rooster Off to See the World.](#) Philomel.

Carle, Eric. [Today's Monday.](#) Philomel.

Carle, Eric. [The Very Busy Spider.](#) Philomel.

Carle, Eric. [The Hermit Crab.](#)Philomel.

Children's Television Workshop. [The The Very Hungry Caterpillar Sesame Street Book of Shapes \(Book of Numbers and Book of Puzzles\)](#). New York Preschool Press. Time-Life Books.

Christelow, Eileen. [Five Little Monkeys Sitting in a Tree](#). Clarion Books.

Conford, Ellen. [What's Cooking, Jenny Archer](#). Turtleback.

Cooke, Tom. [Sesame Street Cookie Monster's Little Kitchen: A Chunky Book](#).

Crews, Donald. [Ten Black Dots](#). Greenwillow Books.

Falwell, Cathryn. [Feast for 10](#). Clarion Books.

Feelings, Muriel. [Moja Means One: Swahili Counting Book](#). Dial.

Florian, Douglas. [A Year in the Country](#). Greenwillow Books.

Galdone, Paul. [Goldilocks and the Three Bears](#). Seabury Press.

Giganti, Paul Jr. [How Many Snails?](#) Greenwillow Books.

Heinst, Marie. [My First Book of Numbers](#). Dorling Kindsley Inc.

Hoban, Tana. [Exactly the Opposite](#). Macmillan Publishing Co., Inc.

Hoban, Tana. [More than One](#). Macmillan Publishing Co., Inc.

Hoban, Tana. [1, 2, 3](#). Macmillan Publishing Co., Inc.

Hoban, Tana. [Round and Round and Round](#). Macmillan Publishing Co., Inc.

Hoban, Tana. [Where is It?](#) Macmillan Publishing Co., Inc.

Hughes, Shirley. [Rhymes for Annie Rose](#). Lothrop, Lee, and Shepard Books.

Hughes, Shirley. [The Nursery Collection](#). Lothrop, Lee, and Shepard Books.

Hulme, Joy N. [Sea Squares](#). Hyperion Books for Children.

Hutchins, Pat. [Clocks and More Clocks](#). Macmillan Publishing Co., Inc.

Hutchins, Pat. [The Doorbell Rang](#). Macmillan Publishing Co., Inc.

Inkpen, Mick. [Kipper's Book of Numbers](#). Red Wagon Books.

Pelham, David. [Sam's Pizza: Your Pizza to Go](#). Dutton Books.

Plummer, David and John Archambault. [Counting Kittens](#). Silver Press.

Prelutsky, John. [Read Aloud Rhymes for the Very Young](#). A. Knopf.

Tafari, Nancy. [Who's Counting?](#) William Morrow & Co.

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Informational Articles

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<http://www.ctb.com/static/resources/prekstandards.jsp>

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Additional Math & Resource Websites

Math in the Home

<http://www.ed.gov/pubs/parents/Math/mathhome.html>

Who Measures What in Our Neighborhood?

<http://www.ed.uiuc.edu/ups/curriculum2002/measure/overview.shtml>

Understand measurable attributes of objects and the units, systems, and processes of measurement

<http://standards.nctm.org/document/chapter4/meas.htm#bp1>

Apply appropriate techniques, tools, and formulas to determine measurement

<http://standards.nctm.org/document/chapter4/meas.htm#bp2>

<http://www.illinoisearlylearning.org/tips.htm#math>

<http://www.illinoisearlylearning.org/tips.htm>

<http://theory.lcs.mit.edu/~emjordan/famMath.html>

<http://www.ed.gov/pubs/EarlyMath/title.html>

www.doe.nv.gov/equity/prekstandards.htm (To download complete copy of Nevada's Pre-K Standards)

www.hippyusa.org (Home Instruction for Parents of Preschool Youngsters))

www.patnc.org (Parents as Teachers National Center)

www.pbs.org (PBS)

www.naeyc.org (National Association for the Education of Young Children (See Position Statement on School Readiness and Signs of Quality Programs))

www.nas.edu or www.4nationalacademies.org (National Research Council)

www.pppctr.org (Practical Parenting Partnerships)

www.nea.org/parents (National Education Association)

www.ncpie.org/ (National Coalition for Parent Involvement in Education)

www.npin.org (National Parent Involvement Network)

www.pta.org (Parent Teacher Association)

www.teachersandfamilies.com (Teachers and Families Working Together)

www.teachersfirst.com/getsource.cfm?id=997 (Examples of finger plays for children)

www.teachersandfamilies.com/open/parent/index.html (Parenting tips related to reading and literacy)

www.readwritethink.org/resources/index.asp (Additional listing of resources for children)

www.carolhurst.com (Carol Hurst's Children's Literature site)

www.virtualpre-k.org (Activities for parents to do with their children)

Appendix

The Pre-K Content Standards are guidelines for teachers to use when developing learning experiences for young children that are grounded in the following guiding principles:

Guiding Principles

1. Children are active learners.

- Children are not passive learners. Instead, they learn through physical, social, and mental activities (Piaget & Inhelder, 1969; Bredekamp & Copple, 1997). Because children learn through firsthand actions with objects and things in their world, their learning occurs and is linked to the overall environment and their cultural experiences (Vygotsky, 1986).
- As active learners, young children need opportunities to observe things and events in their here-and-now world, develop their own ideas, try them out, find out what happens, and come up with their own answers (Dewey, 1944; Glassman, 2001).
- Play is how children find out about their world. All types of play - manipulative play, play with games, rough-and-tumble play, and socio-dramatic play - provide children with opportunities to try things out, see what happens, and learn (Rubin, Bukowski & Parker, 1998).
- Organizing children's learning spaces through centers of interest is a good way to help children learn. Centers are clearly marked, organized play and work areas with a theme. Centers encourage children to make decisions, learn new skills, practice skills previously gained, as well as interact with others.
- Centers offer children and teachers a great deal of flexibility. Because they do so, centers may support the needs of the children, especially diverse learners. For example, the needs of children with physical disabilities can be accommodated by providing pathways, low tables, or other necessary adjustments. Those children who need privacy or less stimulation can be offered quiet, protected centers and spaces for active learning.

2. Development and learning are interrelated.

- Learning about oneself, developing social skills and achieving motivation are all part of intellectual development. Children's ideas about themselves affect not only interactions with others, but also how they understand themselves as learners (Ladd, 1990). In turn, children's intellectual abilities and their control over language are also linked to their social skills. Children who can use language well in social situations or those who can understand another person's point of view are more likely to be those with strong social skills.
- Likewise, learning to write and read depends in great part on how children feel about themselves and their ability to achieve (Bandura, 1997). Children who believe they can learn, and expect to achieve, do so (Seefeldt, Denton, Galper & Younosai, 1999).

3. Growth and learning are sequential.

- Growth and learning move in a basic sequence (Berk, 2001). For instance, learning generally proceeds from the concrete to the abstract. The early years are when children learn best from concrete, firsthand experiences. These firsthand experiences will help children with their ability to express their ideas through drawing, painting, and verbal and written descriptions (Bredenkamp & Copple, 1997; Piaget & Inhelder, 1969).

4. Each child is an individual learner.

- Each child is an individual. Each will grow, develop, and learn at his or her own pace. Because children's development is due to both biological maturity and the environment, the rate of their development and learning varies. Therefore, actual age is not the best sign of where a child should be developmentally.
- Even though development and learning occur in an orderly way, development is often uneven. Some children will move ahead in language learning while being behind in physical or motor development. Others will demonstrate a skill one day and not repeat it for another month.

- A child's genetic makeup may be related to health growth and development, but an environment that does not provide good nutrition or language experiences may slow down healthy growth. Severe disabilities affect normal growth and development as well. Children with disabilities may benefit more from early intervention than those without these disabilities.

5. **Development and learning are embedded in culture.**

- Culture, the social context in which children learn, grow, and develop, is defined as the language, knowledge, beliefs, art, moral, laws, customs, and ways of living that are passed on to future generations (Cole, 1999). Social groups, the family, neighborhood, religious or ethnic groups within a society pass on their customs, values, or moral principles to the young.
- Beginning at birth, the culture socializes children to become members of a society. But, children are not just products of the culture they grow in. As children grow, they may decide what to model from the cultural influences they are exposed to, shaping their cultural context over time (NRC & IM, 2001).

6. **Family involvement is necessary.**

- To develop a close attachment between young children and their families demands family involvement. Teachers should consider each child's unique circumstances, respect each family, and encourage involvement between families and preschools to help with a child's academic success and later school achievement (NRC, 2001a).
- Family members and teachers must work together. Preschool experiences build on and extend what children learn at home. In turn, children's learning in school is extended and continued in the home.

7. **Children's learning can be clarified, enriched, and extended.**

- Appropriate early educational experiences can extend, expand, and clarify the ideas, concepts, language and social skills children gain spontaneously. With the guidance of highly knowledgeable, trained, and skilled adults who understand both children and what children need to know, children can learn more than could on their own (Vygotsky, 1986).