WHITE PAPER

Basic Concepts as Building Blocks to School Success

Assessment to Intervention Using the Boehm Test of Basic Concepts-Third Edition (Boehm-3)

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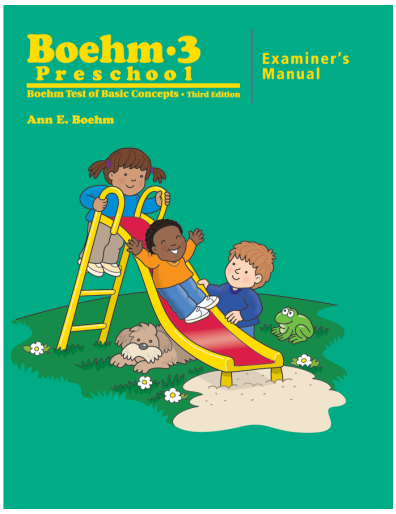
Purpose and Use

The *Boehm Test of Basic Concepts-3* (Boehm-3) and *Boehm Test of Basic Concepts-3 Preschool* (Boehm-3 Preschool) were designed to assess young children's understanding of basic relational concepts important for language and cognitive development, as well as success in school across all learning areas. The major purpose of each level of the test is to identify gaps in learning to guide instruction and intervention during a child's schooling toward success.

Classroom teachers, speech-language pathologists, school psychologists, and other special education professionals can all use and benefit from this knowledge about the students they teach.

Content

Boehm-3 Manual Cover



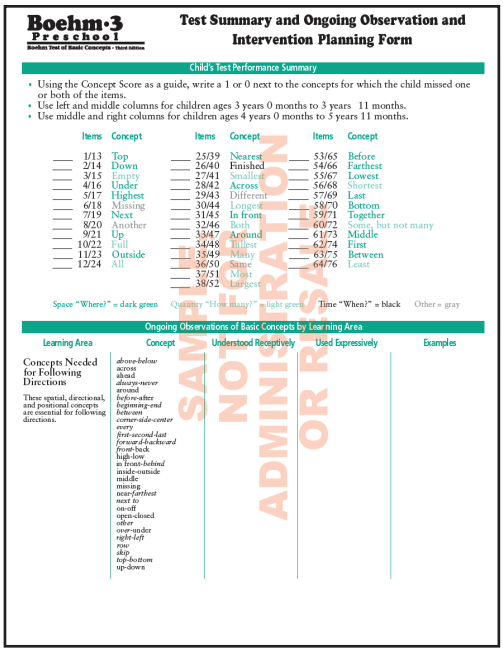
Boehm-3 Preschool Manual Cover

The Boehm-3 covers 50 concepts that appear in print materials, reading and mathematics curricula, and professionals' verbal instructions for kindergarten through second-grade students. The test is group administered but can be individually administered as a criterion-referenced measure to older children who have special needs. **Two parallel forms of the test include English and Spanish norms for fall and spring.** Assessing the whole class early in the fall offers professionals a quick picture of the students' proficiency in concept understanding for instructional planning. In the spring, use of the alternate form of the test makes assessment of progress easy and accurate. Validity was established by review of mathematics and reading curricula and concepts used by teachers when giving instructions.

The Boehm-3 Preschool is an individually administered test that covers 26 concepts at each of two age levels (3 years 0 months to 3 years 11 months; 4 years 0 months to 5 years 11 months) and is also appropriate as a criterion-referenced measure for older children who have special needs. Each concept is assessed twice to identify concepts that are emerging, concepts that the child knows, or concepts that need development. English and Spanish norms are presented at 6-month age bands. The child responds to verbal instructions by pointing to one of four options on a picture.

Note: Unless otherwise noted, all further references to the Boehm-3 include both levels of the test—Boehm-3 and Boehm-3 Preschool.

The Boehm-3 includes a *Test Summary and Ongoing Observation and Intervention Planning Form* that summarizes the child's performance by concept and provides a framework for ongoing observation of the child's use of basic concepts across contexts. Professionals can develop instructional activities for individual students or the class as a whole or to track student progress.



Boehm-3 Preschool
Boehm Test of Basic Concepts - Third Edition

Test Summary and Ongoing Observation and Intervention Planning Form

Child's Test Performance Summary

- Using the Concept Score as a guide, write a 1 or 0 next to the concepts for which the child missed one or both of the items.
- Use left and middle columns for children ages 3 years 0 months to 3 years 11 months.
- Use middle and right columns for children ages 4 years 0 months to 5 years 11 months.

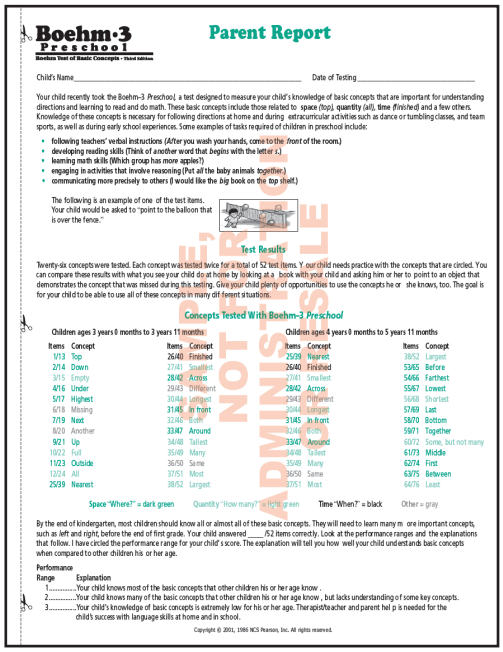
Items	Concept	Items	Concept	Items	Concept
___ 1/13	Top	___ 25/39	Nearest	___ 53/65	Before
___ 2/14	Down	___ 26/40	Finished	___ 54/66	Farthest
___ 3/15	Empty	___ 27/41	Smallest	___ 55/67	Lowest
___ 4/16	Under	___ 28/42	Across	___ 56/68	Shortest
___ 5/17	Highest	___ 29/43	Different	___ 57/69	Last
___ 6/18	Missing	___ 30/44	Longest	___ 58/70	Bottom
___ 7/19	Next	___ 31/45	In front	___ 59/71	Together
___ 8/20	Another	___ 32/46	Both	___ 60/72	Some, but not many
___ 9/21	Up	___ 33/47	Around	___ 61/73	Middle
___ 10/22	Full	___ 34/48	Tallest	___ 62/74	First
___ 11/23	Outside	___ 35/49	Many	___ 63/75	Between
___ 12/24	All	___ 36/50	Same	___ 64/76	Least
		___ 37/51	Most		
		___ 38/52	Largest		

Space "Where?" = dark green Quantity "How many?" = light green Time "When?" = black Other = gray

Ongoing Observations of Basic Concepts by Learning Area

Learning Area	Concept	Understood Receptively	Used Expressively	Examples
Concepts Needed for Following Directions These spatial, directional, and positional concepts are essential for following directions.	*above-below* across ahead *always-never* around *before-after* *beginning-end* *between* *corner-side-center* *every* *first-second-last* *forward-backward* *front-back* high-low in front-*behind* inside-outside middle missing *near-farthest* *next to* on-off open-closed *other* *over-under* *right-left* *row* *skip* *top-bottom* *up-down*			

The Boehm-3 also includes a *Parent Report Form* that presents a list of the concepts covered in the assessment and highlights those the child needs to learn with suggested ways that the parent(s) can help the child learn basic concepts at home.



Boehm-3 Preschool
Boehm Test of Basic Concepts - Third Edition

Parent Report

Child's Name_____ Date of Testing_____

Your child recently took the Boehm-3 Preschool, a test designed to measure your child's knowledge of basic concepts that are important for understanding directions and learning to read and do math. These basic concepts include those related to space (*top*), quantity (*all*), time (*finished*) and a few others. Knowledge of these concepts is necessary for following directions at home and during extracurricular activities such as dance or tumbling classes, and team sports, as well as during early school experiences. Some examples of tasks required of children in preschool include:

- following teachers' verbal instructions (*After you wash your hands, come to the front of the room.*)
- developing reading skills (Think of another word that *begins* with the letter *s*.)
- learning math skills (Which group has *more* apples?)
- engaging in activities that involve reasoning (Put all the baby animals *together*.)
- communicating more precisely to others (I would like the *big* book on the *top* shelf.)

The following is an example of one of the test items. Your child would be asked to "point to the balloon that is over the fence."

Test Results

Twenty-six concepts were tested. Each concept was tested twice for a total of 52 test items. Your child needs practice with the concepts that are circled. You can compare these results with what you see your child do at home by looking at a book with your child and asking him or her to point to an object that demonstrates the concept that was missed during this testing. Give your child plenty of opportunities to use the concepts he or she knows, too. The goal is for your child to be able to use all of these concepts in many different situations.

Concepts Tested With Boehm-3 *Preschool*

Children ages 3 years 0 months to 3 years 11 months

Items	Concept
1/13	Top
2/14	Down
3/15	Empty
4/16	Under
5/17	Highest
6/18	Missing
7/19	Next
8/20	Another
9/21	Up
10/22	Full
11/23	Outside
12/24	All
25/39	Nearest
26/40	Finished
27/41	Smallest
28/42	Across
29/43	Different
30/44	Longest
31/45	In front
32/46	Both
33/47	Around
34/48	Tallest
35/49	Many
36/50	Same
37/51	Most
38/52	Largest

Children ages 4 years 0 months to 5 years 11 months

Items	Concept
25/39	Nearest
26/40	Finished
27/41	Smallest
28/42	Across
29/43	Different
30/44	Longest
31/45	In front
32/46	Both
33/47	Around
34/48	Tallest
35/49	Many
36/50	Same
37/51	Most
38/52	Largest
53/65	Before
54/66	Farthest
55/67	Lowest
56/68	Shortest
57/69	Last
58/70	Bottom
59/71	Together
60/72	Some, but not many
61/73	Middle
62/74	First
63/75	Between
64/76	Least

Space "Where?" = dark green Quantity "How many?" = light green Time "When?" = black Other = gray

By the end of kindergarten, most children should know all or almost all of these basic concepts. They will need to learn many more important concepts, such as *left* and *right*, before the end of first grade. Your child answered ____/52 items correctly. Look at the performance ranges and the explanations that follow. I have circled the performance range for your child's score. The explanation will tell you how well your child understands basic concepts when compared to other children his or her age.

Performance

Range	Explanation
1	Your child knows most of the basic concepts that other children his or her age know.
2	Your child knows many of the basic concepts that other children his or her age know, but lacks understanding of some key concepts.
3	Your child's knowledge of basic concepts is extremely low for his or her age. Therapist/teacher and parent help is needed for the child's success with language skills at home and in school.

Why Assess Basic Concepts

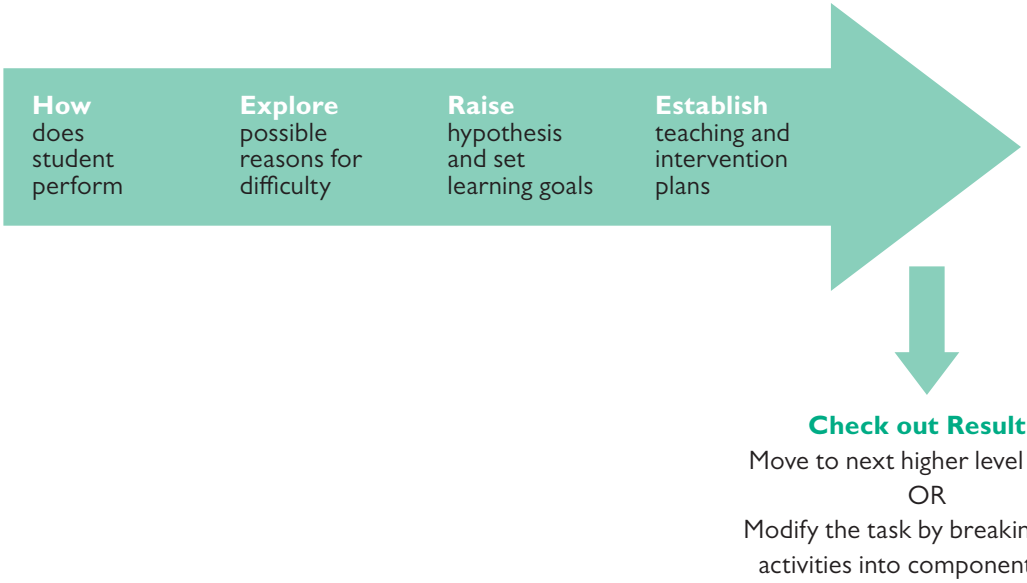
Basic relational concepts are challenging for many children because:

- their use can shift, depending on the situation (the group with the *most* people in one situation may have the *fewest* in another; the *tallest* animal in one group may be the *shortest* in another)
- they are applied across contexts of **space, quantity,** and **time**—understanding their application in one context does not ensure understanding in another
- they are used across sensory modalities such as identifying a sound that is *high* or *low* as well as a spatial position
- many describe positions that are reversible (the object on *top* of one pile may be placed at the *bottom* of a different pile; the *first* car in one line may be the *last* in another
- they are used across many levels of difficulty from concrete to abstract
- they present different challenges (identifying the *front* and *back* of objects with a defined back, such as a chair, is easier than *front* and *back* of a table which depends on viewer's perspective)

Boehm-3 test items were chosen to align with early childhood curricular materials and state and local benchmarks and to reflect language usage in the classroom. The concepts included (such as *top-bottom, more-less,* and *begin-end*) involve the ability to make relational decisions about persons, things, and events. They help children describe objects, quantities, and experiences; order events; follow directions and classroom routines; and to regulate emotions and behaviors. They are integral aspects of language development and of early learning in reading and mathematics. Basic concepts are also essential for making comparisons, sequencing, and classifying and serve as building blocks for more complex concepts and problem solving. Thus, basic concepts are important to functioning in all areas of children's lives. Children who do not understand them will struggle in the classroom and in other activities outside of school, such as sports. These issues are important to take into account when planning instruction or more intensive intervention.

An Integrated Assessment Process Using the Boehm-3

Multiple sources of information are needed when using outcomes of the Boehm-3 to plan the next steps for intervention. These are summarized briefly in the following figure.



How does the student perform?

- Consider how the child performs overall in relation to age or grade level
- Identify concepts that present difficulty for a particular child or for many children that need to be targeted for instruction

Explore possible reasons for difficulty

- Observe children of concern in ongoing classroom activities and identify ways basic concepts are embedded (or could be embedded) into classroom routines and activities
- Observe ways in which the teacher provides encouragement for the development and use of these concepts

Raise hypotheses and set learning goals

- Consider areas of difficulty or strength (including the child's language background and early learning experiences)

Establish teaching and intervention plans

- Engage children of concern in a brief teaching activity to test out hypotheses
- Develop a systematic plan for teaching basic concepts
- Chart progress as children are taught basic concepts across learning areas (reading, mathematics and science, classroom rules)
- Use outcomes to provide support for common core standards and state benchmarks

Connection to RTI

The Boehm-3 tests can be used to inform teaching and more specific intervention activities for all students in the classroom, fitting with the current focus on Response to Intervention (RTI). All three levels of RTI can be addressed:

Tier 1: Assistance for all professionals to help children learn concepts as component skills across curricular areas. Classroom teachers can use outcomes early on during the school year to focus on concepts difficult for many children and practice their use across activities in reading, math, science, and following classroom directions.

Tier 2: Help professionals provide intensive intervention within the context of the regular classroom. For children experiencing difficulty, teachers working with specialists can try to establish the basis of the difficulty (see section that follows) and develop a series of teaching activities and a means to track progress.

Tier 3: Provide professionals with information needed to guide diagnostic assessment and to provide intensive intervention services.

Guidelines for Interpretation

Outcomes of the Boehm–3 can be used to yield norm-referenced, criterion-referenced, and strategy-based information. These outcomes:

- identify students who know most concepts, but demonstrate difficulty understanding a few key concepts;
- identify concepts that need to be targeted for instruction in ongoing classroom activities;
- compare a student's performance to normative information for students at the same grade level (Boehm-3) or age level (Boehm-3 Preschool);
- identify students who may be "at risk" for learning problems and who may need referral for additional assessment;
- understand some of the reasons why a student has difficulty following teacher directions and may have behavioral problems in such areas as turn-taking and transitioning from one activity to another;
- conduct pre-post testing to help determine a student's progress as a result of teaching or intervention; and
- identify strategies students use and teaching supports needed.
- Consider how the use these concepts within the directions of other tests might influence outcomes. If a child does not understand the direction (same versus alike), the test outcomes need to be reconsidered.

Evidence-based Factors to Consider When Interpreting Outcomes and Planning Intervention

- *Enriched language exchanges* at home facilitate the development of language, including basic concepts. Regardless of a parent's economic background, the more parents talk, the greater the vocabulary growth in their children (Hart & Risley, 1995, 1999).
- The *nature of the exchange* between parents and children as partners plays a key role. This is a reciprocal process as parents and their child interact with each other and as children gain confidence in their language ability (Hart & Risley, 1999).
- Large differences occur in the frequency of adult-child conversations and the conversational forms used by adults from different cultural backgrounds (Heath, 1983). Thus, children come to school with very different types of oral language practice—some come with practice using the language forms expected by teachers; others have not had such practice.
- Familiarity with *task demands* is another key issue. Many children have not had the practice to label pictures or to respond to *what, when, why, where,* and *how* questions. Thus, there are discontinuities between the demands and expectations of home versus academic contexts (Peña & Quinn, 1997). Children may perform poorly on tests or school tasks due to the unfamiliar format of the task direction. This poor performance may be *misinterpreted* as a language delay or lack of readiness skills.
- Basic concepts are difficult for many children since they have no constant referent. The animal *tallest* in one group may be *shortest* in another (Boehm, 1982; deVillers & deVilliers, 1978).
- Increasing levels of abstraction may apply to the same concept from simple to complex. A box may be the *same* color, size, or shape as another box, or it may by the same in respect to all of these attributes (Boehm 1976, 1986).
- There is an order of acquisition of basic concepts that refer to space, time, and dimension (Clark, 1972). For example, more is learned before *less*; then *less* is confused with *more*; and finally *less* is learned. Therefore, many of the errors children make are part of a developmental pattern that can be useful to consider when planning intervention.
- Children may be able to use concepts such as *before* and *after* to describe familiar events such as going to a restaurant or birthday party, but not apply the same concepts to a line of objects where the context is not familiar (French & Nelson, 1985).
- English Language Learners may be familiar with some concept terms in their home language and other concept terms in English. Thus, bilingual children may know more concepts when both languages are examined (Erickson & Iglesias, 1986), an important consideration for curriculum planning (i.e., are we dealing with their knowledge of the term in English or is practice needed in learning the concept).
- Children with special needs have considerable difficulty learning many basic concepts, such as those children who are blind (Caton, 1977), hearing impaired (Bracken & Cato, 1986), learning disabled (Kavale, 1982), cognitively challenged (Nelson & Cummings, 1981), and those with speech and language difficulties (Spector, 1979).

Strategies for Intervention: Basic Concepts As Building Blocks for Thinking and Problem Solving

The goal of the plan suggested in this section is to provide children with practice with basic concepts at increasing levels of difficulty. The development of basic concepts begins during the preschool years and can be built on as the child moves through kindergarten through grade two and above.

There is not a fixed level of presentation. Concepts need to be used in many ways as they apply to everyday experiences. Where to start intervention depends upon the age and needs of the child (or class). Exploring concepts using the child's own senses is particularly appropriate at the preschool level as well as for children who have special needs.

With children who are beginning to learn a target concept, use concrete activities (gestures, toys, tone of voice) to reinforce children's understanding and use of the concept. Such concrete examples can be used along with sensory presentations, having fun with objects to which children can relate. At the same time, encourage children to use the concepts of interest to describe objects and activities.

Thus, many of the strategies suggested can be used at the same time—the goal is to reinforce the concept of interest across situations in a way children can relate to and remember.

The strategies suggested also need to be revisited as the children move from kindergarten, grade 1 and grade 2, so that they can apply concepts across contexts and as tools of thinking.

Sensory:

- Relate the concept to children themselves ("touch the top of your head")
- Engage children in actions ("crawl under the table")

Concrete:

- Use concrete objects to illustrate the concept in the child's immediate environment ("find the box on the bottom shelf")

Two-dimensional:

- Use photos or pictures to illustrate the concept
- Read books that illustrate the target concept
- Have children draw pictures and then ask them to respond to questions that refer to these pictures ("what is on the top of your picture?")
- Help children make the transition to line drawings or practice pages

Productive Use in the Child's Own Speech

- Model use of the target concepts during everyday activities
- Engage in activities such as playing with puppets and asking questions that encourage the child to use the target concept
- Use different types of questions to elicit target concepts (*what, which, where, when, why, who*). Note that response to these types of questions develop for many children during the preschool years, **but not all children have had practice responding to them by the time they enter kindergarten.**
- Introduce alternative labels where appropriate (boxes may be the *same* or *alike*; a child is at the *end* of the line or is *last*)

Developing Representations in Memory

- Encourage children to close their eyes and form mental pictures of situations that represent the concept. For example, show children an object *under* another object such as a basketball under a chair. Then have children close their eyes and take a picture of what they say. Next they can describe their "picture." The goal is to have children gain a representation of the concept they can remember. This is important because many basic concepts are relative and shift across situations.

Using Concepts Across Contexts

- Learning needs to be extended across contexts:
  - the child may be able to apply concepts such as *before* and *after* in a familiar context, such as explaining what happens at a birthday party, but not be able to identify objects as *before* or *after* other objects on a line.
  - concepts such as *before* and *after* refer to space, time, and quantity (the child *before* another child in line; events that happen *before* or *after* others in a story sequence; the number that comes before or after the number 8). This use of concepts across contexts needs to be an important goal of teaching.

Applications As Tools of Thinking

- **Reversing:** The application of many concepts can be reversed in time or space—the toy to the *right* of the child can be moved to the *left* of the child.
- **Comparing:** Basic concepts are frequently used to make comparisons as in, "Which box is the *biggest*? *Smallest*?"
- **Sequencing:** Many basic concepts are used to order relationships such as, "Put the boxes in order from the *biggest* to the *smallest*."
- **Classifying:** Basic concepts are often a qualifier to classify objects or situations that represent the same relationship. This relationship can range from easy to very difficult as in, "Find *all* of the boxes that are *big*" or "Find *all* the children who have their *right* hand up."
- **Used in combination with other concepts:** The ability to respond to multiple-part directions is essential to school learning and cognitive development. This use can range from easy to difficult as in, "Find *all* the blocks that are *big*" or "Find *all* the long red blocks *under* the table."

Additional Comments about Intervention

- Transfer is more likely to occur if the child uses the concept name and can manipulate objects.
- Modeling and providing feedback facilitate learning, including prompts, gestures, familiar examples, and encouraging comments.
- Lots of practice at increasing levels of difficulty with fun examples can pay off. This is a gradual process that continues into second grade and beyond.

In sum, the assessment to intervention loop is an ongoing process as children learn concepts across contexts (reading, mathematics, science, time, feelings) and apply them as tools of thinking and problem solving.

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