

Early Childhood Briefing Paper Series

All Children Ready for School: Cognition and General Knowledge



—Alice Frazier Cross

Ready Child + Ready Family + Ready School = Successful School Readiness

This working paper examines *cognition and general knowledge* associated with ready children. It is part of a series identifying early education practices associated with successful school readiness for all children. Topics in this series focus on ready children (health and physical well-being, language and literacy, cognition and general knowledge, social-emotional skills), ready families, and ready schools.

Two children in Ms. Mary's Head Start class have been building with blocks. Ms. Mary calls out, "It's time for clean-up." Anna and Jimmy continue to build. Ms. Mary helps them begin by saying, "Can you put four blocks away?" Jimmy isn't sure how many four is and picks up as many as he can hold in his arms. The teacher says, "Wow, you've got a lot of blocks. Let's count them together" and helps Jimmy count his six blocks as he slides them onto their places on the shelf. Anna puts her four away and gets another four, saying, "That's eight so far!" Later at circle time, Ms. Mary guides the children in remembering what they saw on a walk. She asks, "What did we see when we looked up high? Do you remember?" A child says, "The sky had clouds." Ms. Mary adds it to the remembering list.

Many people think that a child who is ready for school is one who knows numbers, letters, and colors. These are indeed important for a child to know and are a part of cognitive skills and general knowledge. However, looking at the readiness equation above, one can see that cognition and general knowledge are only one part of the school readiness equation.

What We Know: Important Child Outcomes Associated with Cognition and General Knowledge

Cognition is how we know, learn, and remember. It involves the thinking skills that children use to make sense of all the general knowledge that they acquire. Cognitive skills enable children to make meanings, patterns, and relationships in their learning, for example, the ability to understand how to count objects in order to pick up four blocks. Among the most basic cognitive skills are perception, attention, imitation, and memory. Children's ability to retain memories increases over time, and they learn strategies to help with remembering, for example, practicing what they want to remember.

The ability to combine cognitive skills helps children to expand their learning. Children begin to make observations, understand cause and effect, learn intentionally, and use symbolic and representational thinking for reading, writing, mathematics, and other skills. At the same time, children begin developing the ability to see relationships among objects by putting them in order and sorting them by type. As they develop and learn, children also learn to solve problems, think logically, and form explanations.

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General knowledge has two components. One component is details about the world in which we live, such as, “The sky has clouds.” This component of general knowledge also includes social understandings, such as, “People have jobs like firefighter, teacher, and doctor.” The second component is the processes of how things work —“Balls fall down when dropped” and “The light comes on when you move the switch,” for example. An important part of process knowledge that contributes to learning is the idea that a process conducted twice in the same way will have the same result.

Cognitive skills and general knowledge are building blocks for school readiness. Cognitive development, along with language and social-emotional development, predicts academic outcomes. Readiness checklists include many items that educators and family members may think of as a single skill, such as naming colors. However, it is important to remember that naming colors involves perception, observation, memory, and language, all cognitive skills, plus being one discrete bit of general knowledge.

Figure 1 presents the cognitive skills and general knowledge that a child has when ready for school. Included are examples of traditional readiness checklist items that relate to each outcome.

Figure 1 Cognition and General Knowledge: Important Learning Outcomes

1. The child uses intentional strategies to remember, learn, and do, including practice, private speech, planning, and reflecting. (Traditional checklist items: follows a two-step direction; sings a song or retells a story.)
2. The child explores, observes, and compares things about himself and his world using color, size, shape, number, and other characteristics. (Traditional checklist items: sorts items by color, size, and shape; orders three objects by size; identifies bigger/smaller.)
3. The child uses representation, as well as invented and common number and letter symbols, to communicate observations, ideas, experiences, and experiments. (Traditional checklist items: recognizes name in print; recognizes some letters and single digit numbers; draws a person with head, eyes, mouth, body, arms, legs.)
4. The child makes predictions, conducts investigations, solves problems, and provides explanations by combining his knowledge and various cognitive skills. (Traditional checklist items: completes a ten piece puzzle.)
5. The child acquires and uses knowledge about the world including names and attributes of things, categories, and relationships. This includes the traditional learning areas of mathematics, science, language and literacy, social studies, music, and art.

What We Know: Effective Practices to Promote Cognition and General Knowledge

Educational research clearly indicates that there are things early educators can do to increase the amount of cognitive skills and general knowledge children attain. The focus of the research has been to determine the effectiveness of early mathematics and science curricula and instructional strategies.

One important research finding is that there is a developmental sequence to how children acquire certain mathematics skills and concepts. Many early educators have thought that providing the right environment and exposure to the right activities would be enough to promote learning. However, educators also need to plan the order of the ideas they introduce to children, so that they present activities that build from one idea and skill to the next. A good way to do this is to choose a curriculum that research has shown to be effective. When educators are continuously aware of how children are developing and learning, they can offer new activities at the best time for each child.

Another research finding pertains to the critical role of the early educator’s communication with the child and how that communication takes place. Language is important to the learning process, and since children are just acquiring language, early educators must provide the vocabulary and descriptions of children’s mathematics and science activities and other projects for them. Conversations and questions are techniques that early educators use, but research shows that educators should also explicitly describe to the children what they observe them doing, use the “think out loud” technique to help children understand the problem-solving process, and

ask questions that help a child move to the next level of understanding. In addition, early educators can support and reinforce children’s learning by writing what children say about their activities, using photos and work samples to help children remember what they have done, and recording key points that have been learned in their math and science activities.

Research on early math and science learning has also found that children acquire more mathematics and science knowledge and skills when provided with a balance of open exploration and focused investigation. Offering the open exploration of well-equipped learning centers during free choice and small group times gives children a chance to become comfortable and learn with the equipment and materials. Focused investigations ask children to use the equipment and materials in new or specific ways, find new solutions, and solve problems in order to stretch their learning. Research has also identified the value of an organized learning environment that includes equipment, materials, games, books, and computer programs that specifically promote exploration and investigation of math, science, and other learning areas.

In summary, the early educator promotes children’s cognitive skills and general knowledge when she:

1. Plans math, science, and other learning goals for the children using (a) a coherent, integrated, standards-based curriculum and (b) knowledge of each child’s developmental characteristics, knowledge, skills, learning styles, and preferences.

2. Provides children with a well-organized environment with equipment, materials, games, books, and computer programs that specifically promote exploration and investigation of math, science, and the other learning areas.
3. Promotes learning in math, science, and other areas by providing a balance of open exploration and focused investigation activities.

4. Uses “thinking out loud,” prompting, conversation, games, and other strategies to enable each child to acquire thinking skills.
5. Uses open-ended questions, provides examples, writes what children say, and verbalizes connections between ideas, skills, activities, and routines to enable each child to acquire knowledge and skills in math, science, and the other learning areas.

Making These Practices Work for ALL Children: The Universal Design of Early Education

An early educator might find it easy to say, “I’ll use ‘thinking out loud,’ prompting, conversation, games, and other strategies to enable each child to acquire thinking skills.” As usual, saying and doing it for each child are two different things. The children who come to our settings bring a wide range of individual characteristics that influence their ability to learn. The data from the Early Childhood Longitudinal Study and other research have shown that there are differences in school readiness associated with the child’s health and well-being, the kinds of early learning experiences the child has previously had, the child’s home language, the child’s abilities and disabilities, and more. Each of these could prevent a child from being able to be ready for school. Furthermore, children who do not have school readiness tend not to catch-up.

A critical question that every early educator must answer is, “What practices should I use to make sure each child is able to access the learning needed for school readiness?” The principles of universal design for school readiness, presented in Figure 2, are an effective approach to ensuring that each child is able to access learning. The basis of the universal design concept is that an object, environment, or other thing has been designed in a way that ensures that everyone can use or access it from the start. An early educator can use the principles to guide her thinking as she adds or fine tunes the evidence-based instructional strategies to respond to children’s learning characteristics.

Table 1 presents the strategies and offers suggestions for implementing them based on universal design.

Figure 2

Application of Universal Design Principles to Early Education

1. The design of the **physical environment** enables all children to have access and equitable opportunities for full participation in all program activities. This includes structures, permanent and movable equipment and furnishings, storage, and materials.
2. The design of **health and safety program components** minimizes risks and hazards for all children. It ensures all children, regardless of health status or condition, have ongoing access to early care and education by minimizing interruptions to their learning due to illness and injury.
3. The design of the **social-emotional environment** offers all children equitable access and full membership to the social-emotional life of the group, and supports their social-emotional development.
4. The design of the **instructional environment** enables all children equitable access to learning opportunities and multiple means for engagement and learning. This includes the curriculum, instructional practices, materials, and activities.
5. The design of **individual assessment and program evaluation practices** provides multiple approaches to finding out what children know and can do in order to equitably assess individual learning, development, and educational progress.
6. The design of **family involvement practices** supports the equitable access and engagement of all families in the full range of experiences. This includes ongoing communication, learning opportunities, and program involvement activities.

Summary & Implications

Recent research has contributed to our knowledge of young children’s cognition and general knowledge. Examples of cognitive skills include attention, representational and symbolic thinking, and problem solving. General knowledge includes the details of the world in which we live. Research has also identified practices that are effective for promoting children’s development and learning in this area. Strategies for promoting children’s readiness include planning the sequential introduction of concepts and skills, providing a learning environment that is thoughtfully organized to give children the equipment and materials that encourage learning in math, science, and other areas, and using strategic conversations and questions to prompt children’s learning.

Furthermore, application of the principles of the universal design of early education to these strategies can ensure that each child will be able to access the learning needed for school readiness. The first step is adopting the personal goal of ensuring that each child will access the needed learning, just as Ms. Mary in Head Start is doing for Jimmy. The next is to begin refining and adding the instructional practices that support each child’s learning. The third is the step of increasing professional learning to take advantage of new results coming from research and practice in the area of cognitive skills and general knowledge, as well as in the other aspects of school readiness. Following these steps, each early educator can contribute to a child’s success in school.

Table 1
Universal Design Applications

Evidence-Based Practices	Universal Design Considerations for the Early Educator
<p>1. The early educator plans math, science, and other learning goals for the children using (a) a standards-based curriculum and (b) knowledge of each child's developmental characteristics, knowledge, skills, learning styles, and preferences.</p>	<ul style="list-style-type: none"> ■ Choose a curriculum that addresses the sequential development of skills in math, science, and other learning areas, and that has guidance for adjusting activities, ideas, and skills to meet each child's needs. ■ Enable each child to demonstrate his learning by using multiple, but comparable, methods of assessment that take into consideration the child's developmental and experiential characteristics. ■ Talk to each child's family to understand the goals they have for their child and to learn about the family's preferences and culture. ■ Offer activities that incorporate children's interests, experiences, and local culture and that help children to reach goals by participating and learning in multiple ways.
<p>2. The early educator provides children with a well-organized environment, with equipment, materials, games, books, and computer programs that specifically promote exploration and investigation of math, science, and other learning areas.</p>	<ul style="list-style-type: none"> ■ Create a physical environment that ensures each child's easy and independent access to all activities, spaces, equipment, and materials by considering each child's sensory, motor, linguistic, cognitive and experiential characteristics. ■ Provide equipment, materials, games/toys, books, and computer programs that use children's home languages and English, and which reflect family experiences and local culture. ■ Offer multiple types of equipment, materials, games, books, and computer programs that provide each child with equal access to the concepts and skills in math, science, and other learning areas.
<p>3. The early educator promotes learning in math, science, and other learning areas by providing a balance of open exploration and focused investigation.</p>	<ul style="list-style-type: none"> ■ Provide guidance and support that enables each child to explore learning centers and the larger environment by motivating some children, helping others to play, or assisting others to try new activities based on individual learning styles and skills. ■ Present children with focused investigations in math, science, and other learning areas by communicating in languages children understand, using pictures, symbols, graphics, and other means. Communicates with families to identify culturally appropriate activities and materials they can carry out at home. ■ Help each child learn to investigate by modeling, prompting, and elaborating on what each is doing and by providing multiple guided practice opportunities. ■ Arrange the environment and the schedule in ways that let children continue projects later in the day or on other days, in response to children's individual energy levels, attention spans, or interests.
<p>4. The early educator uses thinking out loud, prompting, conversation, games, etc. to enable each child to acquire thinking skills (recall, logical thinking, prediction, planning and reflection, and problem solving).</p>	<ul style="list-style-type: none"> ■ Offer activities that facilitate each child's thinking skills, such as individual and small group planning and playing word, card, and tile games to facilitate memory, while considering each child's various cognitive skills. ■ Explicitly name and demonstrate thinking skills by "thinking aloud" using the child's home language, English, or communication system. Uses different levels of prompting, modeling, and guidance to initiate a specific positive approach to learning. S/he may begin with minimal assistance and gradually increase his/her level of assistance to assist the child to act. ■ Adjust activities that promote thinking skills by shifting the pace of the activity, including adequate wait time for any child to respond, and by providing devices to support memory and communication. ■ Use individualized questioning and prompting techniques to nudge each child's thinking to the next level.