Executive Function & Self-Regulation

Executive function and self-regulation skills are the mental processes that enable us to plan, focus attention, remember instructions, and juggle multiple tasks successfully. Just as an air traffic control system at a busy airport safely manages the arrivals and departures of many aircraft on multiple runways, the brain needs this skill set to filter distractions, prioritize tasks, set and achieve goals, and control impulses.

When children have opportunities to develop executive function and self-regulation skills, individuals and society experience lifelong benefits. These skills are crucial for learning and development. They also enable positive behavior and allow us to make healthy choices for ourselves and our families. Executive function and self-regulation skills depend on three types of brain function: working memory, mental flexibility, and self-control. These functions are highly interrelated, and the successful application of executive function skills requires them to operate in coordination with each other.

- Each type of executive function skill draws on elements of the others.
- Working memory governs our ability to retain and manipulate distinct pieces of information over short periods of time.
- Mental flexibility helps us to sustain or shift attention in response to different demands or to apply different rules in different settings.
- Self-control enables us to set priorities and resist impulsive actions or responses.

Children aren’t born with these skills—they are born with the potential to develop them. If children do not get what they need from their relationships with adults and the conditions in their environments—or (worse) if those influences are sources of toxic stress—their skill development can be seriously delayed or impaired. Adverse environments resulting from neglect, abuse, and/or violence may expose children to toxic stress, which disrupts brain architecture and impairs the development of executive function.

By focusing on real-life daily situations such as bedtime and mealtime, the Ready4Routines intervention seeks to strengthen executive function skills in adults and children, while also increasing predictability within young children’s lives.
Providing the support that children need to build these skills at home, in early care and education programs, and in other settings they experience regularly is one of society’s most important responsibilities. Growth-promoting environments provide children with “scaffolding” that helps them practice necessary skills before they must perform them alone. Adults can facilitate the development of a child’s executive function skills by establishing routines, modeling social behavior, and creating and maintaining supportive, reliable relationships. It is also important for children to exercise their developing skills through activities that foster creative play and social connection, teach them how to cope with stress, involve vigorous exercise, and over time, provide opportunities for directing their own actions with decreasing adult supervision.

At a Glance: 8 Key Executive Functions

Executive functions are skills everyone uses to organize and act on information. If your child has executive functioning issues, he may struggle with some or all of the following skills.

**Skill 1: Impulse Control**
What it means: Impulse control helps your child think before acting.
How it looks: Kids with weak impulse control might blurt out inappropriate things. They’re also more likely to engage in risky behavior.

**Skill 2: Emotional Control**
What it means: Emotional control helps your child keep his feelings in check.
How it looks: Kids with weak emotional control often overreact. They can have trouble dealing with criticism and regrouping when something goes wrong.

**Skill 3: Flexible Thinking**
What it means: Flexible thinking allows your child to adjust to the unexpected.
How it looks: Kids with “rigid” thinking don’t roll with the punches. They might get frustrated if asked to think about something from a different angle.

**Skill 4: Working Memory**
What it means: Working memory helps your child keep key information in mind.
How it looks: Kids with weak working memory have trouble remembering directions—even if they’ve taken notes or you’ve repeated them several times.

**Skill 5: Self-Monitoring**
What it means: Self-monitoring allows your child to evaluate how he’s doing.
How it looks: Kids with weak self-monitoring skills may be surprised by a bad grade or negative feedback.

**Skill 6: Planning and Prioritizing**
What it means: Planning and prioritizing help your child decide on a goal and a plan to meet it.
How it looks: Kids with weak planning and prioritizing skills may not know which parts of a project are most important.

**Skill 7: Task Initiation**
What it means: Task initiation helps your child take action and get started.
How it looks: Kids who have weak task initiation skills may freeze up because they have no idea where to begin.
**Skill 8: Organization**
What it means: Organization lets your child keep track of things physically and mentally.

**What Is Executive Functioning?**
By: Joyce Cooper-Kahn and Laurie Dietzel

**The Basics**
- The executive functions all serve a "command and control" function; they can be viewed as the "conductor" of all cognitive skills.
- Executive functions help you manage life tasks of all types. For example, executive functions let you organize a trip, a research project, or a paper for school.
- Often, when we think of problems with executive functioning, we think of disorganization. However, organization is only one of these important skills.

The term "executive functioning" has become a common buzzword in schools and psychology offices. This is more than just a passing fad. In fact, neuropsychologists have been studying these skills for many years. We believe that the focus on executive functioning represents a significant advancement in our understanding of children (and adults!) and their unique profile of strengths and weaknesses.

**A Formal Definition of Executive Functioning**
Now (drum roll please), here is a formal definition of executive functioning: _The executive functions are a set of processes that all have to do with managing oneself and one's resources in order to achieve a goal. It is an umbrella term for the neurologically-based skills involving mental control and self-regulation._

What mental control skills are covered under this umbrella? Different researchers and practitioners have their own favorite lists, although the overall concept is basically the same. We use the list proposed by Drs. Gerard A. Gioia, Peter K. Isquith, Steven C. Guy, and Lauren Kenworthy. These psychologists developed their understanding of executive functions through sound research and created a rating scale that helps parents, teachers, and professionals understand a particular child and think more specifically about how to help.

Before looking at the list of specific characteristics encompassed by the broad category of executive functions, we’d like to provide an example that makes the concepts more concrete.

**Understanding Executive Functions by Looking at Life without Them**
Thinking about what life is like for someone with weak executive functioning gives us a better understanding of the way these core skills affect our ability to manage life tasks. In the interest of making the concepts immediately relevant and meaningful, our example focuses on an adult, since we assume that most people reading this book are adults, too. Throughout the rest of the book we’ve included mostly examples of executive functioning in younger people.

**The Road Trip without a Map**
We’d like to tell you a story about our friend, Robin, who lives life without the benefit of strong executive functioning. Robin is a composite of many individuals we have known, and she struggles with weaknesses in executive skills, despite her well-intentioned efforts to reform herself.
One day in May, Robin gets a phone call from her Aunt Sue in Merryville, Missouri. Aunt Sue is planning a family reunion in July, and she wants to know if Robin and her family can come. All of the extended family will be there. The little town will be overrun with relatives and it is going to be a great corralling of the family from all across the United States. Robin is excited at the prospect and eagerly says, "Of course we'll be there! We wouldn't miss it!"

Aunt Sue gives Robin all the particulars, including the dates of the reunion and places to stay. Robin rummages around in the kitchen junk drawer for a pencil while her aunt talks, but she never does find one with a point on it. She promises to herself to find a pencil and write down all the details just as soon as she gets off the phone. But by the time she hangs up, she can't remember the specifics. She makes a mental note to call back soon to get the dates.

That evening, Robin excitedly tells her husband and two children about the reunion. Her husband asks when it will take place. "Some time in July. I don't remember exactly." He says, "Well, please find out this week because I have to request vacation time at work." Their fifteen-year-old son exclaims, "Hey, I thought July was when I was supposed to go to Band Camp!" "Didn't you remember?" Robin's daughter practically shouts, "I'm going to Ocean City with Julie and her family sometime in July." Robin blows up at them all, yelling, "Why are you all being so negative? This is supposed to be fun!"

About once a week, Robin's husband reminds her to get the information about the reunion. She promises to do so. (And she really means to get around to it!) Finally, in June, Robin's husband gets very annoyed and says, "Do it now! I'm going to stay right here in the kitchen until you call!" Robin makes the call and gets the dates as well as the other particulars. Her husband harrumphs around the house the rest of the evening because now he has only three weeks left before the requested time-off. Luck is on their side, though, because he manages to arrange the vacation around work, and the reunion dates do not conflict with the kids' activities.

Over the next three weeks, thoughts about the trip float through Robin's head from time to time. She thinks about how the kids will need to have things to do in the car since it's a long trip. She thinks about taking food and snacks for the ride. She thinks about getting her work at the office cleared up in advance so she can be free of commitments for the vacation. She thinks, "I really should take care of that stuff." A few days before it is time to leave for the two-day drive to Missouri, she starts piling stuff into the van, including clothes and other supplies. (You can only imagine what the inside of this van looks like!) Finally, it's time to pile the people into the van, too. On the way out of the house, one of the kids asks, "Who will be taking care of the cats while we're gone?" Robin moans, "Oh no! I forgot about that. We can't just leave them here to die and there's no one to take care of them! Now we can't go. What will we tell Aunt Sue?" Her husband takes over, and starts calling around the neighborhood until he finds a teenager who can do the pet sitting. The crisis passes. The cats will be fine.

So, they're off. Robin's husband drives the first shift. He pulls out of the neighborhood, gets onto the main highway, and then asks, "So, what's the game plan? What's the route?" Robin answers, "Missouri is west, so I know we have to go west." He looks at Robin incredulously and says, "You don't know any more details than that? Well, get out the map. We can't just head west with no more information that that!" And, of course, Robin says, "What map? I don't have a map." Robin's husband sighs and shakes his head. "Oh no! Another road trip without a map! Why didn't you tell me you were having trouble getting it all organized? I could have helped." Robin replied, "I didn't have any trouble. Everything is fine. We're in the car, aren't we? We'll get there. What are you so upset about?"
Do you think Robin had made reservations for where to stay along the way? Do you think she had planned out how much cash they would need for the trip or made it to the bank ahead of time? These and many other details, of course, had escaped planning.

A List of Executive Functions

With this example as a base, let's turn back to the question of what specific abilities are covered under the umbrella term of executive functioning. Below is the list of executive functions from Dr. Gioia and his colleagues. We've included a specific illustration of each executive function from our case study of Robin in parentheses after each definition.

1. **Inhibition** - The ability to stop one's own behavior at the appropriate time, including stopping actions and thoughts. The flip side of inhibition is impulsivity; if you have weak ability to stop yourself from acting on your impulses, then you are "impulsive." (When Aunt Sue called, it would have made sense to tell her, "Let me check the calendar first. It sounds great, but I just need to look at everybody's schedules before I commit the whole family.")

2. **Shift** - The ability to move freely from one situation to another and to think flexibly in order to respond appropriately to the situation. (When the question emerged regarding who would watch the cats, Robin was stymied. Her husband, on the other hand, began generating possible solutions and was able to solve the problem relatively easily.)

3. **Emotional Control** - The ability to modulate emotional responses by bringing rational thought to bear on feelings. (The example here is Robin's anger when confronted with her own impulsive behavior in committing the family before checking out the dates: "Why are you all being so negative?")

4. **Initiation** - The ability to begin a task or activity and to independently generate ideas, responses, or problem-solving strategies. (Robin thought about calling to check on the date of the reunion, but she just didn't get around to it until her husband initiated the process.)

5. **Working memory** - The capacity to hold information in mind for the purpose of completing a task. (Robin could not keep the dates of the reunion in her head long enough to put them on the calendar after her initial phone call from Aunt Sue.)

6. **Planning/Organization** - The ability to manage current and future-oriented task demands. (In this case, Robin lacked the ability to systematically think about what the family would need to be ready for the trip and to get to the intended place at the intended time with their needs cared for along the way.)

7. **Organization of Materials** - The ability to impose order on work, play, and storage spaces. (It was Robin's job to organize the things needed for the trip. However, she just piled things into the car rather than systematically making checklists and organizing things so important items would be easily accessible, so the space would be used efficiently, and so that people and "stuff" would be orderly and comfortable in the car.)

8. **Self-Monitoring** - The ability to monitor one's own performance and to measure it against some standard of what is needed or expected. (Despite the fact that they're off to Missouri without knowing how to get there, with almost no planning for what will happen along the way, and without a map, Robin does not understand why her husband is so upset.)

The executive functions are a diverse, but related and overlapping, set of skills. In order to understand a person, it is important to look at which executive skills are problematic for her and to what degree.
Fostering Key Cognitive Skills Called Executive Function through Children’s Play
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Definition of Executive Function—refers to a group of skills that helps us to focus on multiple streams of information at the same time, monitor errors, make decisions in light of available information, revise plans as necessary, and resist the urge to let frustration lead to hasty actions.

Three Components of Executive Function
1. Working Memory—capacity to hold and manipulate information in our heads over short periods of time (e.g., remembering a phone number long enough to dial it; stop reading when interrupted and go back to the same place; follow multiple steps—go put your jackets away, wash your hands and sit at the table for lunch; or taking turns in group activities.

2. Inhibitory Control—skill we use to master and filter our thoughts and impulses so we can resist temptation, distractions, and habits and to pause and think before we act (e.g., push aside daydreams so we can work; Biting our tongue and say something nice; controls emotions rather than yelling, etc.; waiting your turn; stop before hitting; ignore distractions; stay on task.

3. Cognitive or Mental Flexibility—capacity to nimbly switch gears and adjust to changed demands, priorities, or perspectives (e.g., saying something to a co-worker privately, but something different in a staff meeting; a friend asks about her haircut and you don’t like it but because you don’t want to hurt her feelings you say something different; changing plans).

A closer look at Executive Function Executive Functions Routine
Working memory and recall—holding facts in mind; accessing long term memory. Planning and Recall
Activation, arousal, and effort—getting started; paying attention; finishing work. Work time and small group time
Controlling emotions—ability to tolerate frustration; thinking before acting or speaking. Problem solving
Internalizing language—using “self-talk” to control one’s behavior and direct future actions. Work time and problem solving
Taking an issue apart, analyzing the pieces, reconstituting and organizing it into new ideas—complex problem solving. Work time and small group time

Readiness: Not a State of Knowledge, but a State of Mind
By Dr. Dan Gartrell

People used to think children were ready for kindergarten if they could say the ABC’s, count, identify colors, and write their first name. Readiness was always more complicated than that, and new brain research is helping us understand what readiness really is. Readiness doesn’t mean just knowing the academic basics. It means a child has a willing attitude and confidence in the process of learning: a healthy state of mind.

How do families help their children gain this state of mind? By being responsive to all areas of their children’s development—physical, emotional, social, cultural, language, and cognitive (thinking). Children are born with a great ability to learn and grow—different kinds of abilities, to be sure, but abilities that individually and together constitute the miracle of humanity.

Adults do best for their children when they nurture this unexpressed potential rather than ignore, reject, or try to train it. Healthy development, and with it school readiness, is the result of secure, responsive adult–child relationships. Here are eight parenting practices that nurture children’s untold potential and readiness to learn.

1. Have contact talks with your child each day. A contact talk is a few moments of shared time between adult and child. Contact talks can happen anytime, day or night—often while reading together, but also while giving a bath, changing diapers (really), taking a walk, riding in a car, or when your child approaches you. When you decide that a contact talk will happen, stop what you are doing. Listen, encourage, and support. Don’t “teach, preach, or screech.” Learn more about this little person and help that child learn more about you, as adult and child together in the family you share.

Contact talks build healthy attachment between an adult and child like nothing else can. They support the development of a child’s self-esteem, social skills, thinking skills, and language abilities (key capacities for school success). If contact talks take place during physical activities, they enhance physical development.

Preschool child in car at night: “The moon is following us!”
Adult (quietly smiling): “I wonder where it’s going.”
Child: “To our house, of course. Moon likes it at our house.”
Adult: “It’s nice to have a home that’s liked.”
Child: “Yep.” (Smiling, continues looking at the moon).

In a few years, this same child will understand that the moon just looks like it is following the car. But no correction of this perception is needed now. What is important is a shared quality moment around the child’s beginning interpretations of the world and the people in it. Contact talks don’t have to be long, but they do have to happen, every day. They tell your child you value her and what she has to say is worthwhile.

2. Recognize that children’s reasoning skills are just beginning to develop. Problem-solving and reasoning skills, what some call executive function, start to develop in the brain at about age 3. These abilities, including the capacity to understand complex situations, accommodate others’ viewpoints, and stay on task, are a work in progress into early adulthood.
It is important to understand that young children don't think the same ways adults do. Young children do not have the same grasp of reality as adults, and they see things from their own (often charming) viewpoints. Recall the young child who said, “The moon is following us.” The adult’s supportive response was to comment, “I wonder why,” and enjoy the child’s creative thinking. Helping the child make connections, and not fact-checking, builds brains. An older child considers the idea of the moon following the car pretty lame. But in the meantime, “Good night, Moon.”

**3. Think of young children's conflicts as mistaken behaviors, not misbehaviors.** A 3-year-old has 36 months of life experience. A 5-year-old has only 60 months. It is an error for adults to think that children misbehave because they “know better” and chosen to do wrong. They are not bad. They are only months old!

Heck, we adults don’t always know how to “behave better.” We work on expressing strong emotions in nonhurting ways our entire lives. Young children are just beginning to learn this complex skill. Children have conflicts and strong disagreements with others, because their incomplete brain development and limited experience means they haven't learned yet how to behave more maturely.

Think of behaviors usually considered to be misbehaviors as mistaken behaviors. One way to think about a mistake is as an error in judgment that may cause or contribute to a conflict. Like all of us, children make mistakes. Young children make more of them because they are beginners in the learning process. They have yet to develop the personal resources they need to prevent, resolve, and forgive the conflicts all of us tend to fall into.

**4. When children have strong conflicts, adults work to teach rather than punish.** Research shows that punishment—infliction of pain and suffering as a consequence for something a person has done—harms healthy brain development. Punishment results in the release of stress hormones, in particular cortisol and adrenaline, which then “slosh around” in children’s brains.

Especially when stress reactions continue over time, they cause children to feel threatened even in nonthreatening situations. In reaction to perceived threats, children resort to patterns of fight-or-flight behavior. In such situations, children often show aggression (to their minds, they are defending themselves) and get into even more trouble. Children who bully are showing aggression to assert their wills in the face of life circumstances they have come to see as challenging.

Thus, the effect of punishment is to make it harder for children to learn the very social skills we want all children to learn. A cycle of stress, acting out, punishment, and more stress, starting early in childhood, can cause problems for an individual throughout life.

**5. Teach, don’t punish. Conflicts do have consequences.** There are consequences for children when they make mistakes and cause big conflicts, and there are consequences for the adult as well. The consequence for an adult is to teach the child another way to behave—how to express strong emotions in ways that aren’t harmful. The consequence for a child is to understand the adult’s expectation that he or she learn a better way to behave.

The goal is to move children from hitting and yelling to using more acceptable methods, like saying, “I am angry!” (Just don’t expect your child to learn this skill overnight. Expressing strong emotions in nonhurting ways is an ongoing task even for us adults.)
Always, the first step when children have conflicts is to tend to anyone who is hurt, then calm everyone down, including yourself. Time away from the situation may be important in helping to calm young (and older) family members. This is not time-out, but a cooling-off time so all can calm down, talk about what happened as soon as time can be made, and learn a better way to deal with the situation next time.

It takes hard work for adults to consistently teach rather than punish. Efforts don’t have to be perfect, but they do need to be honest and well intentioned. Adults who use guidance are firm when they need to be—but firm and friendly, not harsh or wishy-washy. To the best of our abilities, we need to model the reasoning and perspective-taking skills we want our children to learn. If children know we love them, even imperfect efforts at guidance can—and do—work. Guidance establishes a foundation children continue to build on, learning how to get along and solve problems as they grow—a foundation for building a healthy state of mind.

6. Use guidance talks. Different from the age-old lecture, a guidance talk is talking with (not at) a child about a conflict. In a guidance talk, the adult acts as a firm but friendly leader, talking with children after all parties have calmed down.

In using guidance talks, first recognize the effort or progress toward emotional restraint your child may have used. For your child to listen to you, you need to convey that you are working with, not against, your child. Work to build your child’s understanding of each person’s feelings during the conflict. Discuss what your child could have done instead, what can be done differently next time, and how your child could help the other person feel better.

It is not helpful to force an apology. Instead, when he is ready, ask your child how he can make things better. Most children forgive more easily than adults. They just need a little time to settle themselves and figure out what happened. Restitution and reconciliation are important goals in using guidance. They help us remember that every person is a full and important family member, even when they make mistakes.

7. Hold family meetings to discuss and figure out problems that repeat themselves. The purpose of family meetings is to teach that differences can be discussed in civil (not disagreeable) ways, and that family members can work together to address difficulties and solve problems.

Be the leader. Know your own mind going into a family meeting and be up front about what you’re willing to negotiate and what you’re not. (There’s got to be something, though, or else why meet?) A key to successful family meetings is this: Everyone has a right to have and express their own viewpoint, but it is important to do so in respectful ways. As with guidance talks, start and end the meetings with positives—thank folks for participating and acknowledge effort, progress, and the togetherness of the family.

Family meetings are not always popular, but when an adult emphasizes mutual respect as a guideline, the meetings can reduce, prevent, and resolve strong emotional issues, even with young children. Family meetings make family problems something to talk about and work on together, rather than let problems be the elephant in the room.

8. We adults (still) make mistakes. Being a parent who is a caring and positive leader is the hardest job in the world. (Second place is a tie between being a caring and competent early childhood professional
and a middle-school substitute teacher!) When we make mistakes in our own behavior, we need to forgive ourselves, forgive the others involved, and learn from the mistakes.

Note, however, when a family member makes a lot of mistakes, has lots of conflicts—consider this a plea for help. Sometimes families need help from outside. This is OK. This difficult step can open the door to a better life for the entire family and help children make progress toward what we all want them to learn and to be.

For me the bottom-line question is this: As our kids get older, what do we want them to do if someone bullies them or pressures them to bully someone else, or (eventually) to experiment with alcohol, drugs, sex, or vandalism? If the answer is to come to us for guidance, then we get it. It’s hard to know how to respond to life’s tough questions, but good relationships with our children, begun when they are infants, will see us through.

Readiness is a State of Mind

Research shows that the best thing we can do to get children ready for school is to form and keep positive relationships with them. Children who are securely attached to their family members accept themselves as worthy individuals. With ongoing family support, they can handle the frustrations, embarrassments, pressures, and successes that come their way. Securely attached children are better able to make friends, work with others, solve problems creatively, learn, and succeed. The best predictor of children's success in school and life is a brain that develops in healthy ways, as a result of their attachments with their family, and especially their parents.

Note: Many of these ideas first appeared in Dan’s four books and his column, Guidance Matters, which is published in the magazine Young Children. The five children in Dan and Julie's blended family are between 35 and 46 years old. Their 11 grandchildren range from age 8 to 23. (Dan brings photos to all events.)

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Three Brain-Based Teaching Strategies to Build Executive Function in Students

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For young brains to retain information, they need to apply it. Information learned by rote memorization will not enter the sturdy long-term neural networks in the pre-frontal cortex (PFC) unless students have the opportunity to actively recognize relationships to their prior knowledge and/or apply new learning to new situations.

Here are some teaching strategies to help build executive function in your students.

1) Provide Opportunities to Apply Learning

When you provide students with opportunities to apply learning -- especially through authentic, personally meaningful activities -- and then provide formative assessments and feedback throughout a unit, facts move from rote memory to become part of the memory bank.

These opportunities activate the isolated small neural networks of facts or procedures, which then undergo the cellular changes of neuroplasticity that link them into larger neural circuits of related information. These extensive neural circuits integrate new information when they are a) simultaneously activated and b) when they recognize patterns in common.

The expanding of related categories of information (Piaget's schema) through executive function activities will consolidate learning into networks. These networks can be activated when students are prompted to use new learning to solve problems or create new products. This is the transfer process that further promotes network activation with the resulting neuroplasticity to construct long-term memory. Without these opportunities for strengthening, any memories learned by rote are simply pruned away from disuse after the test.

2) Introduce Activities to Support Developing Executive Function

Students need to be explicitly taught and given opportunities to practice using executive functions such as how to learn, study, organize, prioritize, review, and actively participate in class. Activities that can support executive function network development include comparing and contrasting, giving new examples of a concept, spiraled curriculum, group collaboration, open-ended discussions. Additionally, executive function is developed when students summarize and symbolize new learning into new formats, such as through the arts or writing across the curriculum. (See The Brain-Based Benefits of Writing for Math and Science Learning.)

Authentic, student-centered activities, projects, and discussions will give students the opportunity to do the following:

- Make predictions
- Solve a variety of types of problems
- Pursue inquiries
- Analyze what information they need
- Consider how to acquire any skills or knowledge they lack to reach desirable goals

This type of student-promoted information and skill seeking strengthens students' attitude about the value of learning. When motivated to solve problems that are personally meaningful, students apply
effort, collaborate successfully, ask questions, revise hypotheses, redo work, and seek the foundational knowledge you need them to learn. And they do this because they want to know what you have to teach.

When students acquire desired facts, skills, or procedures to achieve authentic, valued goals, the information has a template (neural circuit) to which it can link. Foundational knowledge is not isolated. Learning is consolidated into related patterns, connected in neural networks of long-term conceptual memory, and available for retrieval and transfer to solve future problems and investigate new ideas.

3) Model Higher Thinking Skills
In planning instruction, consider how and when you will model these higher thinking skills and provide opportunities for students to activate their developing executive function networks throughout the learning process.

Judgment
This executive function, when developed, promotes a student's ability to monitor the accuracy of his or her work, and to analyze the validity of information heard or read. Techniques such as estimation with feedback and adjustment, editing and revising one's own written work using rubric guidance, or evaluating websites using criteria to separate fact from opinion are examples of promoting the development of networks for judgment.

Prioritizing
This executive function helps students to separate low relevance details from the main ideas of a text or topic of study. Prioritizing is the executive function that guides students when they plan an essay, select information to include in notes, and evaluate word problems in math for the relevant data. Prioritizing also promotes one's ability to combine separate facts into a broader concept with recognition of degrees of relevance and relatedness.

Prioritizing networks will be activated as you guide students to organize, plan ahead, keep records of their most successful strategies, and use this information to make the most efficient use of their time.

Setting Goals, Providing Self-feedback and Monitoring Progress
Until students fully develop these pre-frontal cortex (PFC) executive functions, they are limited in their capacity to set and stick to realistic and manageable goals. As they develop these executive functions, they need guidance to recognize their incremental progress they make as they apply effort towards their larger goals. This is part of the "video game model" described in my previous blog, How to Plan Instruction Using the Video Game Model.

Prior Knowledge Activation and Transfer Opportunities
Plan activities where students can relate what they know from past experiences to their current learning and tie it to the larger concept. When you provide learning experiences by which students can apply new learning to multiple applications, you promote the neural construction of larger conceptual networks that make the new information a valued tool and part of long-term memory. An example would be the use of the rules of magnetism and geographic facts to discover how to use a compass.

Metacognition
Taking the time to plan learning contexts that are personally desirable often means going beyond the curriculum provided in textbooks. This is a hefty burden when you are also under the mandate of teaching a body of information that exceeds the time needed for adequate activation of prior knowledge and mental manipulation. When you plan for and teach with mental manipulation for executive function in mind, your students will come to recognize their own changing attitudes and achievements. When students begin to experience and comment on these insights, consider sharing the processes you used to create the instruction that they respond to positively. Describe your mental manipulation, challenges, and the executive functions you used to create something new as you found the authentic active learning opportunities that activated the students' interest, perseverance, and higher levels of thinking.

These are teachable moments to promote student metacognition, where they can recognize their abilities to extend their horizons and focus beyond simply getting by with satisfactory grades. Help them make the connection that they can build their executive function of long-term goal-directed behavior when they choose to review and revise their work, even when it has been completed, rather than to be satisfied with "getting it done." Your input helps students see the link between taking responsibility for class participation, proactive collaboration, and setting high self-standards for all classwork and homework such that they can say, "I did all I could to do my best."

Making the Case for Investing in Executive Functions
As the caretaker of your students' brains during the years of rapid prefrontal cortex development, you should consider how you can activate and guide the development of your students' greatest resources -- strong executive functions. The opportunities you provide for mental manipulations using these critical neural networks are precious gifts. These tools will empower them to achieve their highest potentials and greatest satisfaction as they inherit the challenges and opportunities of the 21st century.

Time Well Spent
Planning instruction and teaching units that activate executive function processing takes teacher and student time -- and it's time that's already severely taxed. However, that time is regained because the learning in these units is successfully retained in long-term memory and re-teaching time is vastly reduced.

The first ones to notice the brain changes of learning that is mentally manipulated through executive functions may be your students. Beyond the increased engagement they experience through active learning, they will find it takes less time to review for tests beyond the unit test, such as a final exam. You'll find that students, who previously didn't have the growth mindset needed to stay with challenging lessons when understanding was not instantaneous, now persevere. But the "payoff" will be especially powerful when their teachers ask you the next year, "What did you do?? The students from your class actually remember what they learned last year."

Now think what this means in terms of time. If you didn't have to re-teach "last year's material" you'd be getting all those weeks of time at the beginning of each unit. Thus the a school that promotes instruction for the activation that is needed for development of strong tracts of executive function and long-term memory will build better brains for its students. These brains will retain learning in sustained, transferable, and retrievable long-term memory. Instead of the re-teaching previously required before new instruction can start, there will be weeks of "found time."
Take Care of Yourself

In the professional learning communities I observe when I travel throughout the country I see dedicated professionals who chose to become educators because of their dedication to making a difference for all students. Teachers are drawn to their career choices for admirable reasons. (We know it is not for the big bucks or having the work day "end at 3.") Creativity, imagination, perseverance, and motivation endure in the educators I meet, even in these times of teacher blame and over-packed curriculum.

It is critical that we prepare today's students with the executive function skill sets they will need for success in the globalized, information explosive, and ever-expanding technologically progressive 21st century. Just as certain is the continued accountability by educators to teach the over-packed curriculum in the existing standards.

Executive Function and School Readiness
Resource Paper, November 2012

What are Executive Functions?
Getting ready to start school is about more than just learning the ABCs. Educators and other experts say that in order to be successful in school, young children need to develop skills in executive functions.

Executive functions underlie your child’s ability to:
• Focus on complicated problems.
• Control impulses.
• Set goals and work toward achieving them.
• Get along with others.

Executive functions serve as the manager of the mind. Some experts have described executive functions as “an air traffic control system at a busy airport to manage the arrivals and departures of dozens of planes on multiple runways.”

Teachers rate these qualities as more important than academic skills like knowing the alphabet or being able to count to 20. Experts say that children who lag behind in these executive function skills are less ready to learn traditional academic skills than their classmates. When surveyed about important qualities for school readiness, kindergarten teachers name qualities like:

• Being curious and enthusiastic about learning.
• Using words to communicate needs and wants.
• Being able to follow directions.
• Being able to take turns and to share.
• Being sensitive to other children’s feelings.
• Being able to sit still and pay attention.
• Not being disruptive in class.
• Being able to focus and finish tasks.

The development of executive functions begins in infancy, and they continue to mature throughout our lives. According to Ellen Galinsky’s recent book, *Mind in the Making*, three key executive functions include: .

1. Focus and self-control.
2. Taking the perspective of others.
3. Communication.
4. Making connections among things or ideas.
5. Critical thinking (e.g., understanding cause and effect).
6. Taking on challenges.
7. Self-direction and engagement.

**Why Are Executive Functions Important?**
Executive functions lay the groundwork for school success. That is why it is so important that young children begin to develop these skills before entering school. Compared with children who show weaker executive functioning, children who start school with strong skills make greater gains in cognitive or academic areas like math or reading.

Children who are behind their peers in these skills show more aggression, have difficulty getting along with others, are disruptive in class, and are slower to master academic skills in school. Later in life, they may have more difficulty managing friendships or getting and keeping a job.

**What Does Executive Functioning Look Like in Your Child?**
Your child can do amazingly complex tasks that rely on executive functioning. Normal childhood games help develop executive functioning. For example, you might remember playing Simon Says. You could obey a direction only if it began with “Simon says.” “Simon says, touch your nose.” “Simon says, pat your head.” “Simon says, sit down.” “Stand up.” You heard an ever-faster stream of directions, and you followed them more and more quickly … until you realized that you had followed a direction without hearing, “Simon says”! You were managing the competing demands of following the instructions while listening for the key ingredient, “Simon says.” This requires the executive function skills of focus and self-control and managing complicated tasks.

In imaginative play, your child makes up complicated rules, develops characters and long story lines, and negotiates with others about who can participate. This kind of play requires the executive function skills of working memory (remembering information about the characters and rules of the game) and understanding the perspectives of others.

Researcher Walter Mischel demonstrated the long-lasting importance of executive function in an experiment sometimes called the Marshmallow Test. In this study, children were given a choice between getting one marshmallow right away or getting two marshmallows by waiting just a few minutes longer. Children who were able to delay their impulses and wait got a better reward. Follow-up research with the same children showed the connection between executive function and later school success.

The researcher noted that children who were able to delay gratification were later more likely to have more positive self-esteem and attain a higher education level.

**Executive Functions and Child Care**
Executive functions are not skills that are learned at a desk with pencil and paper or through flash card drills. Executive functions are learned through repeated experiences where adults gradually guide children toward the development of skills.
A high-quality early child care setting helps children develop executive function – and sets them up for success in school and in later life. As children are more able to show self-direction and self-control, less direction is required from caregivers.

A child care program can support your child’s skills by:

- Maintaining a daily routine with activities at predictable times (e.g., circle time, followed by free play at activity centers, snack, outside play, lunch, nap, etc.).
- Having an orderly environment with defined spaces, storage for toys and activity centers for different types of play.
- Providing opportunity for child-led activities, such as free choice in centers or imaginative play, with flexibility to allow time to complete activities.
- Setting expectations for gradually longer “time on task” as children get older.
- Setting clear rules and expectations for behavior.
- Giving children age-appropriate jobs such as cleaning up, hanging up their own coat, being the line leader or serving their own food.
- Promoting empathy and perspective-taking in resolving conflicts. (“How did Jenny feel when that happened?”)
- Planning games and songs that require turn-taking, memory, sequencing, and stop-and-start, such as Duck-Duck-Goose, Simon Says, Memory, “I’m going on a picnic,” “roll-call” songs, Candyland, etc.
- Involving children in story time discussions about “why?” “what if?” and “what then?”
- Starting and ending the day in a “plan-do-review” routine. Children describe what they will do that day and reflect on their day at the end.
- Supporting learning about how to join an activity that has already started and how to get along by planning activities for small groups (e.g., three children at the sand table, five in the house area).

These are just a few examples of good practices that “scaffold” or support the development of executive function in the daily routines of a child care setting.

**What Does This Look Like in Practice?**

A scene you can see every day is your child’s caregiver helping children transition from outside playtime to an inside activity. A caregiver using some of the strategies above might:

- Give a five-minute advance warning to children before a play period ends.
- Use a familiar cue such as a song or call-out that children must respond to (“Day-o!”).  
- Have a set routine for lining up and going inside.

With a warning, children can finish a game. They know that soon they will be asked to line up and come inside from recess. They know what behavior is expected (lining up by first come first served, or a certain order) and what will come next (going inside, hanging up coats and washing hands.)

**Practices That Work Against the Development of Executive Function**

- Large group sizes or high child:staff ratio.
- Disengaged staff or not enough chance for children to interact directly with adults.
- Unpredictable routines or lack of schedule.
• Too many transitions during the day, or not enough time to focus on completing an activity.
• Crowded, chaotic environments.
• Too much screen time (crowding out other, richer, concrete experiences interacting directly with people).
• Overly strict rules or discipline taken to an extreme (too much standing in line, not being allowed to talk at mealtimes, etc.).

**Professional Development for Teachers Supports Executive Functioning in Children**

A high-quality early childhood program depends on teachers and caregivers who have the education and ongoing training to support the school-readiness of all children. In a high-quality program:

a) Teachers understand child development and the importance of executive function for school readiness.

b) They use successful classroom management strategies to promote age-appropriate behaviors and support executive function for children at different stages of development.

c) They plan daily activities based on the program’s curriculum and the individual needs of children.

A well-prepared teacher has training that includes information about how to recognize and support age-appropriate behaviors and how to recognize andflag children who might have difficulty and need additional screening or supports to succeed. Child Care Aware® of America supports training for early childhood teachers that includes social, emotional, physical and cognitive development, which are the core areas that make up early childhood development programs.

In many publicly funded pre-K programs, teachers are required to complete early childhood education degrees that include this essential training.5 Similar requirements are being phased in for teachers in Head Start programs. However, in many states, this training is not a requirement for caregivers in child care settings.

Recent research by Child Care Aware® of America has shown that only 20 states require caregivers in child care centers to have any qualifications in early childhood education beyond a high school degree.6 Our research has also shown that many states do not have strong requirements for child:staff ratios and group size in licensed centers and family child care homes. We have also found that many states have minimal requirements for structured activities in small family child care homes to support the development of executive function and school readiness.

**Conclusion**

Executive functions help us manage complex tasks, plan our actions and get along with others. They set the stage for school readiness and are a key part of development in the early years and beyond. A high-quality child care program can support children’s development of these important skills. Child Care Aware® of America is encouraging parents to look for a high-quality program with well-trained teachers who are ready to promote the development of executive function for young children.

**Additional Resources**

• Child Care Aware®, *Resources for Parents and Guardians Choosing Care*, http://childcareaware.org/parents-and-guardians

• Center on the Social and Emotional Foundations of Early Learning, http://csefel.vanderbilt.edu/
Nonacademic Skills Are Key To Success. But What Should We Call Them?
May 28, 2015 Anya Kamenetz, LA Johnson/NPR

More and more people in education agree on the importance of learning stuff other than academics.

But no one agrees on what to call that "stuff".

There are least seven major overlapping terms in play. New ones are being coined all the time. This bagginess bugs me, as a member of the education media. It bugs researchers and policymakers too.

"Basically we're trying to explain student success educationally or in the labor market with skills not directly measured by standardized tests," says Martin West, at the Harvard Graduate School of Education. "The problem is, you go to meetings and everyone spends the first two hours complaining and arguing about semantics."

West studies what he calls "non-cognitive skills." Although he's not completely happy with that term.

The problem isn't just semantic, argues Laura Bornfreund, deputy director of the education policy program at the New America Foundation. She wrote a paper on what she called "Skills for Success," since she didn't like any of these other terms. "There's a lot of different terms floating around but also a lack of agreement on what really is most important to students."

As Noah Webster, the great American lexicographer and educator, put it back in 1788, "The virtues of men are of more consequence to society than their abilities; and for this reason, the heart should be cultivated with more assiduity than the head."

Yet he didn't come up with a good name, either.

So, in Webster's tradition, here's a short glossary of terms that are being used for that cultivation of the heart. Vote for your favorite in the comments — or propose a new one.
According to the Partnership for 21st Century Learning, a research and advocacy group, these include the "4Cs of critical thinking, collaboration, communication and creativity," as well as "life and career skills" and "information, media and technology skills."

The problem, says West, is that "if anything, all the evidence would suggest that in the closing decades of the 20th and 21st centuries, cognitive skills became more important than ever." So this term, although it's often heard in business and technology circles, doesn't necessarily signal the shift in focus that some researchers want.

Character education has a long history in the U.S., with a major vogue in the 1930s and a revival in the 1980s and 1990s. Beginning a few years ago, the KIPP charter schools in New York City started to emphasize a curriculum of seven "character strengths": grit, zest, optimism, self-control, gratitude, social intelligence and curiosity.

"We’re not religious, we’re not talking about ethics, we’re not going to give any kind of doctrine about what is right from wrong," says Leyla Bravo-Willey of KIPP Infinity in Harlem. "But there are some fundamental things that make people really great citizens, which usually include being kind."

West argues that the use of "character" is inappropriate in research and policymaking because of its moral and religious connotations.

He notes that many of the qualities on the KIPP list — grit and self-control, for example — are designed to prepare students for success. "That’s in tension with a traditional understanding of character, which often implies something being good in and of itself — which often includes some notion of self sacrifice," says West.

That distinction doesn’t bother Bravo-Willey. She says that the school is responding to parents' own wishes that their children be happy and good as well as successful.

Grit is a pioneer virtue with a long American history — think of the classic western True Grit. When Angela Duckworth was working on her dissertation in the mid-2000s, she chose the term to encapsulate the measures of self-control, persistence and conscientiousness that she was finding to be powerful determinants of success. It quickly caught on — maybe too quickly, the University of Pennsylvania psychologist says.
"I'm grateful for the attention, but that gratitude and amazement was quickly replaced by anxiety about people thinking that we had figured things out already." She's worried that grit is being overemphasized: In a recent paper, she argued that grit measures aren't ready to be incorporated into high stakes accountability systems. "I'm also concerned that people interpret my position to be that grit's the only thing that matters."

Larry Nucci at UC Berkeley, who has studied moral development and character education for 40 years, has stronger words for grit. "I think it's flavor of the month. It's not very substantive, it's not very deep."

Carol Dweck, the Stanford University psychologist, chose the term mindset in 2007 for the title of her bestselling book.

"Growth mindset" is the belief that positive traits, including intelligence, can be developed with practice. "Fixed mindset" refers to the idea that intelligence and other talents are set at birth.

"In my research papers I had some very, very clunky scientific-sounding term for the fixed and the growth mindset," she says. "When I went to write the book I thought, these will not do at all."

Mindset has caught on tremendously in both the business and education worlds. But Dweck's concern is that it's being used willy-nilly to justify any old intuition that people might have about positive thinking in the classroom.

"When people start thinking, 'I'll make the kids feel good and they'll learn,' that's how something like the self-esteem movement gains traction," — a 1980s trend that led to lots of trophies but little improvement in achievement.

This term is most strongly associated with the work of Nobel Prize-winning economist James Heckman. He analyzed large data sets to show that attributes such as self-discipline and persistence — not just academic achievement — affected education, labor market and life outcomes.

This term is "ugly, broad, nonspecific," argues Carol Dweck — and she's a fan. "I'm the only person who likes the term," she says. "And I'll tell you why: It is a very diverse group of factors and the reason it's been hard to come up with a name is that they don't necessarily belong together."
Martin West at Harvard uses this term himself, but he says he's always careful to acknowledge that it can be "misleading."

"Every skill or trait is cognitive in the sense that it involves and reflects the processing of information of some kind in our brains," he says. And West adds that traditional academic skills more often than not are complements, not substitutes, for the attitudes and personality traits captured by the term "non-cognitive skills."

Nobody I spoke with hates this term.

"Increasingly teachers who are on the front line say that it's very important to teach kids to be more socially and emotionally competent," says Roger P. Weissberg, chief knowledge officer of the Collaborative for Social and Emotional Learning (CASEL), which promotes the concept and the term nationwide. "Teachers feel, and growing research supports, that it helps them academically, it improves school climate, it improves discipline, and it's going to help them to be college and career — and life — ready."

The only problem is that the "skills" part may not be seen as encompassing things that are more like attitudes or beliefs, like growth mindset. And the "social and emotional" part, again, may be seen as excluding skills that are really cognitive in nature.

This is tough, right?

Employers commonly use "soft skills" to include anything from being able to write a letter, to showing up on time and having a firm handshake. Most of the researchers I spoke with felt this phrase downplays the importance of these skills. "Soft skills, along with 21st century skills, strike me as exceptionally vague," says West. "I don't know that there's anything soft about them."

So the struggle persists. Maybe one day there will be a pithy acronym or portmanteau to wrap all these skills up with a bow. SES? SEL? N-COG? Gri-Grow-Sess? Let us know what you think.
When asked to describe her job, a kindergarten teacher said that teaching 5-year-olds is like trying to keep crickets in a basket: when you open the lid to put in a few more crickets, the others jump out. Anyone who teaches kindergarten can relate to this description; sometimes it seems that just managing a roomful of kindergartners takes up almost all the teacher’s energy, leaving little for teaching academic skills.

In today’s kindergarten classrooms, where demands for academic learning are on the rise, teachers can no longer wait until their “little crickets” simply outgrow their hard-to-manage behaviors. In fact, teachers rate “difficulty following directions” as their number one concern about children, indicating that more than half of their students experience this difficulty (Rimm-Kaufman, Pianta, & Cox 2001).

Teaching 5-year-olds to regulate their own behaviors becomes one of the major goals, adding yet another “R” to the list of basic skills children learn in kindergarten.

What is self-regulation?
Self-regulation is a deep, internal mechanism that enables children as well as adults to engage in mindful, intentional, and thoughtful behaviors. Self-regulation has two sides: first, it involves the ability to control one’s impulses and to stop doing something, if needed—for example, a child can resist his immediate inclination to blurt out the answer when the teacher poses a question to another child. Second, self-regulation involves the capacity to do something (even if one doesn’t want to do it) because it is needed, such as awaiting one’s turn or raising one’s hand.

Self-regulated children can delay gratification and suppress their immediate impulses enough to think ahead to the possible consequences of their action or to consider alternative actions that would be more appropriate. While most children know that they are supposed to “use their words” instead of fighting, only children who have acquired a level of self-regulation are actually able to use them.

This ability to both inhibit one behavior and engage in a particular behavior on demand is a skill used not just in social interactions (emotional self-regulation) but in thinking (cognitive self-regulation) as well. For example, to read the word cat when it appears under a picture of a dog, a child must overcome the desire to pay more attention to the picture and instead focus on the word (Bialystok & Martin 2003). In fact, research shows that children’s self-regulation behaviors in the early years predict their school achievement in reading and mathematics better than their IQ scores (Blair 2002; Blair & Razza 2007).

Furthermore, if a neural system is repeatedly exercised, it will continue to develop, as with exercising a muscle. Conversely, if children do not systematically engage in self-regulatory behaviors at a young age, the corresponding brain areas may not develop to their full potential. There is growing evidence that self-regulation can be taught in the classroom (Blair & Razza 2007; Diamond et al. 2007).

Let’s look at some strategies for doing so.
How can kindergarten teachers promote children’s development of self-regulation?
Although children come to kindergarten with different levels of ability to self-regulate, there are four simple strategies teachers can use to help all children develop this critical ability.

• **Teach self-regulation to all children, not just those thought to have problems.** All young children benefit from practicing deliberate and purposeful behaviors, such as repeated switching from one set of rules to another or resisting the temptation to function on autopilot. For example, during a calendar activity, instead of having children recite the dates as a memorized sequence, a teacher can alert students to the fact that two numbers are out of order. This way, children have to follow the number sequence and monitor the order the numbers are in to be sure it is correct.

• **Create opportunities for children to practice the rules of a certain behavior and to apply those rules in new situations.**
When children are constantly regulated by adults, they may appear to be self-regulated, when in fact they are “teacher regulated.” To be able to internalize the rules of a certain behavior, children can practice them in three ways:

First, **children can follow the rules** that are established and monitored by somebody else (most often by an adult, and sometimes by another child). It is a typical occurrence in a classroom when a teacher, for example, tells children that they can get up and leave only after their names are called.

Second, **children need to be able to set rules for each other and monitor how those rules are followed** (something that happens on the playground, for example, when children set rules for taking turns when jumping rope and make sure nobody breaks those rules; violators who jump out of turn are not invited to play next time.

Finally, they need to apply the rules to themselves—for example, a child who wants to join some classmates playing a game but remembers that she needs to finish the book first and stays in the listening center. The good news is that teachers can view a healthy amount of tattling in kindergarten as evidence of children’s growing self-regulation!

• **Offer children visual and tangible reminders about self-regulation.**
Learning to regulate one’s own behavior is in many ways similar to learning other competencies, such as literacy or numeracy. For young children, early stages of learning to read or to count involve the use of hands-on activities and manipulatives like magnetic letters or Unifix cubes. Similarly, early stages of learning self-regulation involve the use of visual and tangible reminders that support children’s memory and attention. For example, kindergartners who have trouble remembering to put their name on their papers will become much more attentive when they put on “editor’s eyes”—that is, a pair of eyeglasses with the lenses removed—to remind themselves to check their work before turning it in. For example, an effective way to settle or avoid a fight about turn taking is to give young children a tangible tool—such as choosing the short straw, tossing a coin, or rolling dice—to determine who goes first in playing a board game or who has the next turn on the computer.

• **Make play and games important parts of the curriculum.**
Not only should play and games not be pushed out of the kindergarten classroom to make room for more “academic” learning, they need to be taken very seriously. Kindergartners learn self-regulation best through activities in which children—and not adults—set, negotiate, and follow the rules. These include make-believe play as well as games with rules. Further, to engage in games like the ones many kindergarten teachers use to teach math or phonics, children have to first have the ability to follow rules that are quite abstract and arbitrary. Children acquire and develop this ability during make-believe play,
when they learn to follow concrete and simple rules such as not grabbing the stethoscope when pretending to be the patient. Instead of getting rid of blocks and dress-up clothes, kindergarten teachers need to primarily focus on improving the quality of make-believe play, ensuring that children have numerous opportunities to engage in acting out complex pretend scenarios—practicing self-regulation (Bodrova & Leong 2005, 2007).

Conclusion
Addressing gaps in knowledge and skills alone cannot guarantee success in learning for all children; we must also address the development of self-regulation as the underlying skill that makes learning possible. Kindergarten Beyond the Journal • Young Children on the Web • March 2008, classrooms present an important opportunity to influence self-regulation in young children. In fact, for many children, school becomes the first and only place where they can learn to regulate themselves. Thus, instruction in self-regulation in the early years deserves the same, if not more, attention as the instruction in academic subjects.

References


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Play: An Important Tool for Cognitive Development
by Shannon Lockhart, HighScope Senior Early Childhood Specialist

Take a look at the play of Gabrielle, a three-year-old who has a plan to play with magnetic tiles:
At planning time, Gabrielle says, “I’m going to play with the doggies and Magnatiles in the toy area. I’m making a tall elevator.” At work time, Gabrielle builds with the magnetic tiles while playing with the small toy dogs, as she planned. She stacks the tiles on top of one another in a tower-like form—her “elevator”—then places some dogs in it. The elevator then falls over. She repeats this several times but the elevator continues to fall over. Gabrielle then arranges the magnetic tiles into squares, connecting them to form a row.

Gabrielle says to Shannon, her teacher, “I’m making doghouses because the elevator keeps falling down.” Shannon says, “I was wondering what you were building, because you planned to make a tall elevator going up vertically, and now you are using them to make doghouses in a long horizontal row. You solved the problem by changing the way you were building.” Gabrielle uses pretend talk while moving the dogs around. At one point she says, “Mommy, Mommy, we are hungry” and opens one of the doghouses and moves the dog inside where a bigger dog is placed. Gabrielle says, “Mommy says the food’s not ready, so go play.” While moving the dogs around, Gabrielle says to herself out loud, “We have to find something to do until the food is ready.” Gabrielle says to Shannon, “Let’s pretend we are going to the park.” Shannon agrees and says, “I’m going to slide down the slide three times and then jump off the climber.”

As Shannon pretends to do this with one of the dogs, Gabrielle watches then copies her and says, “My dog jumped higher than yours.” She then says, “Mommy says we have to go home now. We need to move our dogs over there so they can eat.” The pretend play continues. At recall time, Gabrielle is using a scarf to hide some objects she played with. When it is her turn to recall, she gives clues about what is under the scarf. She shows the group a couple of magnetic tiles and dogs. Shannon asks her what she did with these materials during work time. Gabrielle talks about the problem with the falling “elevator” and then recounts the story about the doggies.

Early childhood educators often make the point that “children learn through play.” But what does this statement really mean? In the scenario described above, what exactly is Gabriella learning as she plays? She is planning what she is going to do, carrying out her plan, and then recalling what she did (in the HighScope Curriculum, this is known as the plan-do-review process). But did we realize that she is developing key cognitive functions such as working memory, self-regulation (e.g., being aware of and controlling her feelings and actions), internal language or “self-talk,” and the ability to organize, focus, plan, strategize, prioritize, initiate, and perform other skills that determine later success in school? Indeed she is, and these cognitive skills are all part of what we call executive function — the cognitive abilities that control and regulate other behavior. Play helps young children develop these abilities. Unfortunately, due to the demands for accountability in public schools and pressure to accelerate young children’s academic learning, time for play is either being eliminated or limited, and play is much less often child-initiated or free from constraints.

In this article, we will review the legitimacy and validity of child-initiated play in young children’s lives, and we will address the basics of executive function so that we can become more intentional in our planning of, and support for, children’s play.
The Importance of Play
Stuart Brown, Founder of the National Institute for Play, has said that “play is anything that spontaneously is done for its own sake...appears purposeless, produces pleasure and joy, leads one to the next stage of mastery” (as cited in Tippett, July 2008; italics added). Edward Miller and Joan Almon describe play as “activities that are freely chosen and directed by children and arise from intrinsic motivation” (2009, p. 15). Jeannine Ouellette refers to play as “activity that is unencumbered by adult direction, and does not depend on manufactured items or rules imposed by someone other than the kids themselves” (Ouellette, 2007, para. 13).

When children play, they are actively engaged in activities they have freely chosen; that is, they are self-directed and motivated from within. Kenneth Ginsburg, stating the position of the American Academy of Pediatrics, says that “play is essential to development because it contributes to the cognitive, physical, social, and emotional well-being of children and youth” (Ginsburg, January 2007, p. 182). Play is so important to children’s development that the United Nations High Commission for Human Rights (1989) recognizes it as a basic right of every child.

The many books and articles written on the subject list a wide range of cognitive, emotional, interpersonal, and creative benefits (refer to the sidebar on p. 4 for some highlights). Many experts agree that play provides the foundation for learning and later academic success. For example, research demonstrates the importance of child-initiated play (as opposed to play defined and directed by adults) in the development of language and literacy skills. When children determine the direction and content of their own play, they have many opportunities to hear and practice language. This type of language-rich play directly influences future development of higher mental functions (Bodrova & Leong, 2007). When children are allowed to initiate their own play, they are then able to express those choices in words and to interact and converse freely with other children and adults. The International Association for the Evaluation of Educational Achievement (IEA) Preprimary Project, a cross-national longitudinal study, found that children’s language performance at age seven was significantly higher when teachers had allowed children to choose their own activities at age four (Montie, Xiang, & Schweinhart, 2007).

Developmental psychologists identify four types of child-initiated play: exploratory play (discovering the properties of materials and tools, not to make something, but for the pleasure of doing it); constructive play (making things); dramatic play (acting out “make believe” or pretend situations and assuming various roles); and for older children, games with rules. Gabrielle was engaging in the first three types of play, but especially in dramatic (make-believe) play. When children spend time in make-believe play, they use self-directed talk and develop other features of the critical cognitive skills of executive function (Spiegel, 2008).

We will look at how child-initiated play in general, and make-believe play in particular, help to develop executive function.

Components of Executive Function
Although researchers have not completely agreed on the elements of executive function, Chris Dendy (2008) outlines five general components based on Russell Barkley and Tom Brown’s work on attention deficit disorders. These components are presented below, with the plan-do-review sequence described in Gabrielle’s play at the beginning of this article serving to illustrate the connection between play and executive function.
Working Memory and Recall
The first component of executive function is working memory and recall, which is the ability to hold facts in one’s mind as well as being able to access them from one’s long-term memory at any point in time (Dendy, 2008). In the HighScope preschool daily routine, planning and recall times are opportunities for children to tap into their working memory and articulate their ideas, choices, and decisions about what they want to do (planning time), and remember and reflect on their work-time actions and experiences (recall time). Planning builds children’s self-confidence and self-control while leading to more concentrated, complex play. Recall time exercises children’s capacities to form and talk about mental images, helps them build their memory skills, and expands their awareness of time outside the present. As presented in the diagram below, Gabrielle is exhibiting these functions during her planning and recall.

Activation, Arousal, and Effort
The second component includes activation (getting started), arousal (paying attention), and effort (finishing work). On a larger scale, this would apply to the whole plan-do-review process. However, work time is the part of the day when children use these functions the most because children are following through with their plans by getting the appropriate materials, carrying through with their intentions while adapting to and solving any

1. Working Memory and Recall Components of Executive Function in Gabrielle’s Play
2. Activation, arousal, and effort
3. Controlling emotions
4. Internalizing language
5. Taking an issue apart, analyzing the pieces, reconstituting and organizing it
Recalls what an elevator looks like and how to build one out of magnetic tiles.

Gets the materials needed to complete her plan.

Controls her emotions by not getting upset or showing frustration when the materials don’t work the way she wants them to.

Uses “self talk” during play as she manipulates the materials and pretends

Works out the problem with the magnetic tiles by using them in a different way.

Recalls the problem with the tiles and describes details of the stories about the dogs

Understands and uses basic concepts and roles of daily living.

Follows through with plan while adding to it and adapting to problems.

Listens to others’ ideas at recall.

Patiently waits for her turn at recall.

Activation, Arousal, and Effort
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process. However, work time is the part of the day when children use these functions the most because children are following through with their plans by getting the appropriate materials, carrying through with their intentions while adapting to and solving any problems that arise, and then completing the task. During work time, these functions are used over and over again as children make new plans and follow through with them. As presented in the diagram on p. 4, Gabrielle sticks with her plan throughout work time, is highly engaged with pretend play, and solves problems and carries through with her intentions until cleanup time. It is important to recognize that it takes purposeful play for these cognitive functions to fully develop. Because their play is self-directed — and therefore meaningful and purposeful to them — children are highly motivated to maintain their engagement. Children who aimlessly wander around during free play are not exhibiting the highest levels of complex play and strategizing needed to use and develop these higher-level thinking skills. Likewise, when children’s play activities are directed by adults, initiation (activation) is taken out of their hands, interest (arousal) is diminished, and actions (effort) may be aimed at pleasing others rather than thinking about and learning from their own experiences.

Controlling Emotions
The third component of executive function is controlling emotions, that is, the ability to tolerate frustration and to think before acting or speaking. This is part of self-regulation. Children with developed self-regulation are more able to control their emotions and behaviors, resist impulses, and exert self-discipline (Bodrova & Leong, 2007). Children who participate in a consistent, reliable problem-solving approach (e.g., HighScope’s six steps to resolving conflicts; Evans, 2002) learn to express strong emotions in nonhurtful ways; appreciate their own views as well as the views of others; listen and discuss the details of problems; recognize that when there is a problem, there are lots of possibilities for solutions; and deliberate, negotiate, and collaborate with others while staying calm when confronted with a conflict or a problem. When the magnetic tiles continued to fall down, Gabrielle could have had an emotional “melt down” or shown strong frustration by kicking at the tiles and walking away. However, due to her self-regulation skills, she stuck with the task and solved the problem by building with the tiles another way. There is evidence that some children who spend a significant amount of time using video games and watching violent media programming imitate what they see, thinking these are acceptable behaviors, and do not know how to self-regulate when frustrated. These children may get angry, even at the game itself (Anderson & Bushman, 2001).

Internalizing Language
The fourth component is internalizing language — using “self talk” — to control one’s behavior and direct future actions. As adults, we internally talk to ourselves throughout the day (e.g., to master problems, control emotions, and plan) — we just remind ourselves not to talk back! With young children, private speech is key to these functions because it helps the children direct their own actions; for example, what to do with their hands, bodies, and voices, which in turn is part of developing self-regulation. Make-believe play in particular is most helpful for the development of private speech. Alix Spiegel quotes Laura Berk: “This type of self-regulating language...has been shown in many studies to be predictive of executive function” (Berk as cited in Spiegel, 2008). Returning to the opening scenario, as Gabrielle plays with the dogs, she uses private speech (internal dialogue) as she directs the pretend play. Children who spend the majority of their time in teacher-directed activities or watching television or computer screens — that is, listening to others
talk — miss out on opportunities to develop self-regulation through internal dialogue and thought.

**Complex Problem Solving**
The fifth component of executive function is *complex problem solving* — taking an issue apart, analyzing the pieces, and reconstituting and reorganizing it into new ideas. During work time and small-group time, children are faced with many challenging problems as part of carrying out their plans and completing tasks. Part of problem solving with young children is helping them recognize that there is a problem and then involving them in the process of finding a solution. When children are engaged and adults avoid jumping in and solving problems for them, the children learn to rely on their own ideas and decisionmaking skills and to see themselves as confident problem solvers. For Gabrielle, through many experiences with magnetic tiles and solving problems, she needed no assistance in solving the problem and coming up with a new idea to continue her plans. Children who lack the experiences in play, and who spend most of their time in adult-organized activities, lack the creativity that it takes to solve problems mentally.

In summary, we as educators are entrusted with the responsibility of fully engaging children’s minds and bodies in the way they learn best. By understanding the importance of play, how it helps to develop key cognitive functions, and what these functions are, we can become more effective in protecting purposeful play and more intentional in our interactions with children during their play. In this issue’s “Classroom Hints” article, we will discuss strategies that assist in the development of execution function in young children. However, most important, we must remember that play is simply about having fun!

**Where Has Play Gone?**
Many of us remember when we could go outside and play until the street lights came on or, in more inclement weather, when we played make-believe games with a friend in our bedroom or build things out of items we found lying around the house. Sadly, a daily time for children to freely choose what they want to do, whether indoors or outdoors, is in jeopardy. More and more, outdoor play is perceived as being too dangerous for children, so children are cooped up in their homes (Metrocom International, 2007). Both at home and at school, children are bombarded by television, DVD and computer games, violent toys that inhibit imaginative play, extracurricular activities, and academic pressure. Needless to say, little time is being allocated to creative play.

Among the greatest threats to children’s creative play are television, video and DVD games, and computers. When children are mindlessly watching a screen, they are not engaging all of their senses. According to the Alliance for Childhood, children spend four-and-a-half hours per day involved in these activities (July 2009). Following a study connecting television watching with attention problems, the American Academy of Pediatrics (AAP; 2001) has recommended that young children — especially those under three who are in the formative years of brain development — have no exposure to television, as a preventative measure against attention problems and subsequent risk of attention deficit-hyperactivity disorder (ADHD) (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004). Yet studies cited by AAP and the White House Task Force on Childhood Obesity (2010) show 43% of children under age two watch television daily, and 90% of children aged 4 to 6 use screen media an average of two hours per day.
A position statement by the National Association for the Education of Young Children (NAEYC), asserts that “research demonstrates that watching violent programs is related to less imaginative play and more imitative play in which the child simply mimics the aggressive acts observed on television” (The National Institute of Mental Health, 1982, as cited in NAEYC, 1994, p. 2). Furthermore, the majority of toys that children play with tend to be violent and expensive toys based on media programs and which encourage children to reenact the aggressive behaviors they see on television, in commercials, or in movies. As children spend more time with media and items that promote violence, the less time they are engaged in activities that help them process violence. “Thus, as the need to work through violence increases, children’s ability to work it through can be seriously impaired” (Levin, 2007, p. 3).

Another major threat to play is pressure to introduce academics. In Crisis in The Kindergarten (Miller & Almon, 2009), the authors argue that children are spending the majority of their day in literacy and math instruction and in standardized testing and test preparation, leaving less than 30 minutes (and sometimes no time at all) in play or choice time. The same restrictions and pressures are being placed on preschoolers. Research shows that the knowledge gained through this type of “cramming” and early pressure to learn ABCs and 123s fades by fourth grade (Miller & Almon, 2009).