

EXECUTIVE FUNCTION SKILLS

What neuroscience reveals about the critical role of planning, time management, and strategic thinking to student success in the media-driven, multitasking twenty-first century

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Section One

THE IMPACT OF MEDIA MULTITASKING:

The Student Relationship to Media and the Effect on Academic Performance

Several studies are raising questions about the possible negative impact that the level of media engagement is having on our students. These studies highlight findings that may seem obvious to many of us, but are apparently counterintuitive to today's students. For example, Karpinski (ScienceDaily, April 14, 2009) found that college students who use Facebook spend less time studying and have lower grade-point averages than lesser-using or non-Facebook-using peers, despite their firm conviction that the time they spend on Facebook doesn't impact their studies. Greenfield's study (ScienceDaily, Jan. 29, 2009) indicates that students who spend more time using different types of technology (social networking, Internet, video games, etc.) become more proficient visual thinkers but are less able to engage in critical thinking and other forms of abstract analysis. Greenfield speculates that the type of attention and learning associated with media-related activities may not promote reflection, analytical thinking, or imagination—abstract activities that are associated with reading and discussion of complex ideas based on text.

Students reported believing that media multitasking enables them to accomplish more because they can participate in several activities at once.

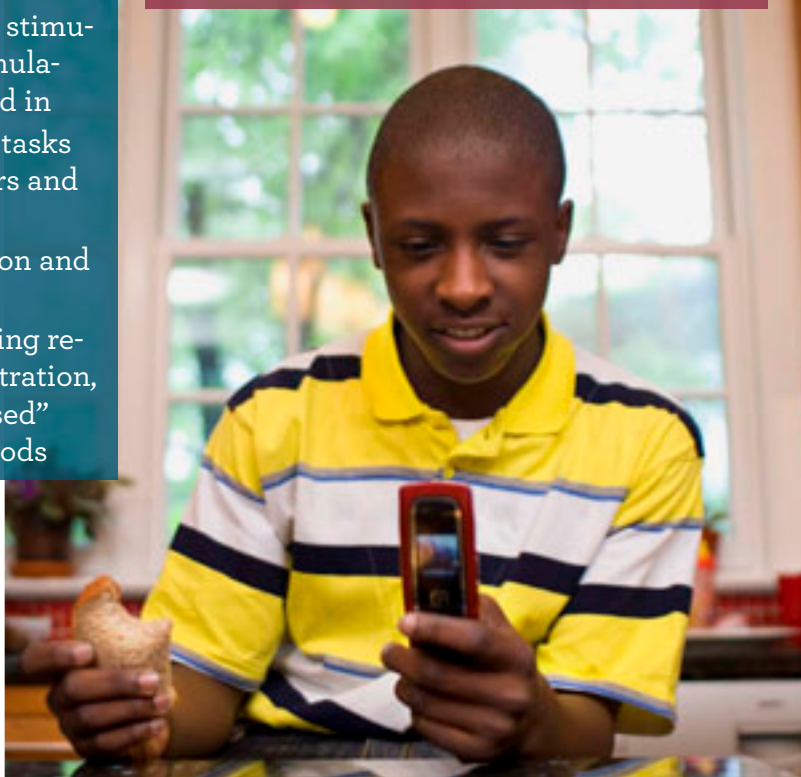


Additionally, studies focusing on students who multitask using various forms of media (called media multitasking) found that these students experience much more difficulty sustaining concentration, and perform at a significantly lower level in tasks requiring complex problem-solving (Kenner & Poldrack 2009). This researcher reported that students who engage in regular media multitasking (e.g., listening to music while monitoring a sports game on TV, e-mailing, texting, or completing homework) had difficulties primarily in four areas:

- selectively ignoring background stimulation in the environment or stimulation the student recently engaged in
- switching between two different tasks (a surprise finding for researchers and students alike)
- focusing on important information and filtering distracting information
- engaging in “depth-based” thinking requiring longer periods of concentration, instead preferring a “breadth-based” approach using shorter time periods

As reported in other studies examining the student relationship to media and its effect on academic performance, students reported believing that media multitasking enables them to accomplish more because they can participate in several activities at once. Students in these studies reported that they could work at greater than 100% productivity, achieved by adding up the percentages of completion from several different areas. Poldrack (ScienceDaily, July 26, 2006), using Functional Magnetic Resonance Imaging (fMRI), reported that students who participated in consistent media multitasking did not engage the higher-order areas of the brain (prefrontal cortex) or the hippocampus for storing information, but instead relied on an area called the striatum, a part of the brain underlying our ability to learn new skills, but not involved in problem-solving activities or in committing learning to memory.

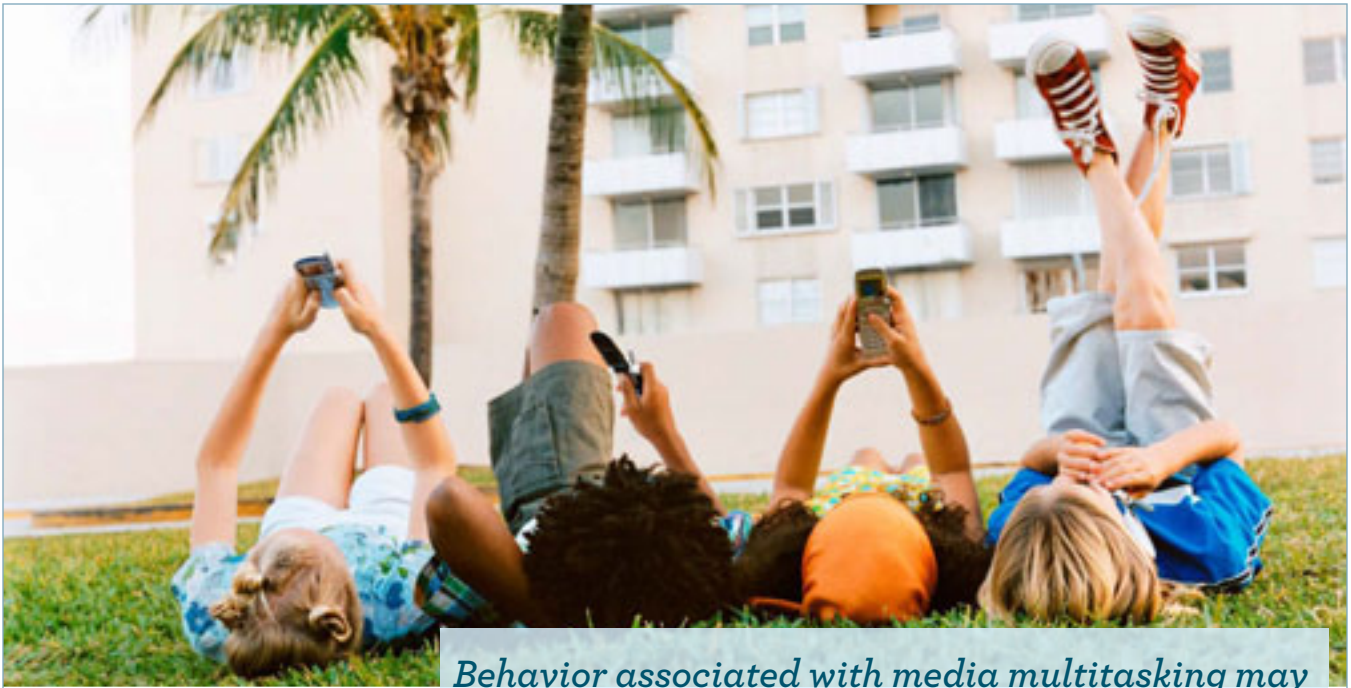
Additionally, Small from UCLA (Rushkoff 2009), also utilizing fMRI, reported that although the media-multitasking students employed many different areas of the brain, students who engaged in greater amounts of multitasking were significantly less able to focus on the individual activities in which they were multitasking when compared to lesser media-multitasking individuals. The researchers noted that students could not filter distracting, irrelevant information when required to focus on a single topic.



At the same time these students “emphatically affirm” an unrealistic sense of accomplishment, and believe they were even more focused and productive because they were multitasking. Nass (as cited in Rushkoff 2008) speculates that media multitasking may stimulate the pleasure centers in the brain, thus motivating the students to continue engaging in this behavior.

According to David Meyer at the University of Michigan (Hamilton 2008), behavior associated with media multitasking may create a type of “brownout” effect neurologically. Dr. Meyer explains that trying to manage several media-related





Behavior associated with media multitasking may create a type of “brownout” effect neurologically.

activities within the same time period causes the brain to shut down neural connections in order to switch attention repeatedly within close time proximity. Reactivating these pathways, called “spreading activation,” involves rebuilding the connections step-by-step, a process that is greatly inefficient and significantly undercuts productivity.

While the younger generation (dubbed by some as “Generation M” for multitasking) seems to glorify its proclivity for mixing several media stimuli within close proximity of one another, in fact this habit contributes to a staccato quality to its thinking characterized by a shallow, short-lived treatment of each item.

Unfortunately, most students are not receiving specific training in school to promote planning and problem-solving systems that would help them organize, store, and recall information—skills necessary for making long-term connections, for in-depth reasoning, and comprehension.

Rushkoff (2009) alludes to this media-overload effect as inducing Internet-driven ADD, featuring delusions of virtual reality. In his article, “The Decade Google Made You Stupid,” Rushkoff quotes Dr. Nass of UCLA with this statement about Bailenson, founder of the Virtual Human Interaction Lab at Stanford University: “Bailenson has discovered the Holy Grail for those seeking a dependable

technology for mind control. I asked him if this freaked him out. He replied, ‘I just see it as where we’re going’” (p. 2).

These words are especially chilling when one understands that those working in the computer and video-game arenas study the properties of addiction in order to recreate the essential components leading to addictive behavior within the media environment (Tierney 2009).

Whether a result of gaming, iPods, surfing the Net, IMing, or just plain watching TV, clearly our students experience large quantities of media exposure. Johnson’s study (2007) indicates that the average middle-school student engages in three or more hours of television and/or video-game playing each day. This high level of media involvement is associated with an elevated risk for subsequent attention difficulties, failure to complete homework, boredom at school, poor grades, and a higher dropout rate at both the high school and college levels.

Exemplary of the current trend toward media multitasking is our youths’ tendency to combine an average of 7 hours and 38 minutes per day of entertainment media (listening to music, sending an average of 97 text

messages per day, instant messaging, participating in online gaming, checking Facebook and other website exploration) with academic pursuits like reading and writing (Kaiser 2010).

When this study was conducted in 2006 (Kaiser), the average entertainment media use time per day was 6 hours and 21 minutes. The authors proclaimed this total would be the final ceiling for media time, and warned of the need to employ better planning and strategic thinking to counter the impact of media use. With the advent of text-messaging and the rapid increase in cell-phone ownership among eight- to eighteen-year-olds, the average time of media use increased by 1 hour and 17 minutes when the study was replicated in 2010. Additionally, the study's authors stated that when media multitasking is accounted for, the total time per day is an astounding 10 hours and 45 minutes of engagement in entertainment media.

This alarming rise in media use has formed the basis, once again, for a call to establish planning and organizational skills to help students better manage time and self-regulate. Especially at risk are students the Kaiser 2010 study labeled "heavy media users," or those averaging 16 hours per day. Light media users consumed 3 hours or less per day. When compared academically, heavy media users received significantly lower grades (47% C's or lower) compared to the light media users (23% C's or lower).

Latzer and Shochat (*ScienceDaily*, Sept. 5, 2008) reported that today's middle-school students have an average bedtime of 11:04 p.m. and an average wake-up time of 6:45 a.m. Those who have a TV or computer in their bedrooms use media an additional half-hour each day and get, on average, thirty minutes less sleep each night. Obviously, this finding has health implications. In addition, new research reveals that stage-four sleep is essential in our ability to reorganize information taken in during the day, then formulate it, keeping and discarding items in order to strengthen long-term memory. Several studies hypothesize that during sleep our brains incorporate recent events with previous learning (*ScienceDaily*, July 26, 2006, and July 11, 2009; Stickgold & Walker, Sept. 5 and 16, and Stickgold & Walker 2005).



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It is no surprise that teachers and school officials complain about specific characteristics, symptomatic of the twenty-first century student:

- evidence of feeling sleepy throughout the school day
- short attention spans
- prevalent distractibility
- difficulty persisting through challenging situations (academic and interpersonal)

Educators struggle to cover massive amounts of curricula and assist students with complex homework assignments, knowing that many students lack the planning and time-management skills to successfully complete a quality product by the due date.

Teachers and administrators labor to help students perform well on state and national assessments, because the instructional demands required for these types of assessments are often at odds with the issues presented by today's learners.



Section One

SO WHAT CAN WE CONCLUDE?

1. Today's "digital natives" spend several hours per day with various forms of technology, often using these forms of media together or while engaged in other activities. A recent Kaiser study stated that youth combine, on average, 7.5 hours per day of media entertainment with academic pursuits.
2. Students risk multimedia saturation. While they may become more proficient visual thinkers, studies show they are less capable of reflection, concentration, analytic thinking, and imagination.
3. Students involved in these behaviors display an unrealistic and false sense of accomplishment, often believing they were even more focused and productive because they were multitasking.
4. Studies using fMRI (brain-imaging) demonstrate that students who participate in consistent media multitasking do not engage higher-order areas of the brain for storing information. Additionally, students are less able to focus on individual activities while multitasking.
5. Mixing multiple media stimuli causes the student's brain to shut down neural connections in order to switch attention; reactivating these pathways involves rebuilding these connections, which in effect cuts down a student's productivity.
6. Students taught planning and problem-solving are provided with skills to help them make long-term connections for in-depth reasoning and comprehension.
7. Planning and organizational skills help students manage their time and self-regulate.

Section Two

PLANNING AND TIME-MANAGEMENT SKILLS:

A Basis for Intervention

Studies asserting the value of teaching time-management and planning skills relative to grades earned in college, lead researchers to view these skill areas as a potential antidote to the challenges posed by media multitasking (Britton & Tesser 1991; Macon, Shahani, Dipboye, & Phillips 1994). Yet, as obvious as this conclusion seems to be to researchers and educators alike, experts such as Dawson (2001) state that adequate assessments in time-management skills do not exist. Additionally, references citing time-management practices frequently offer resource pages absent a definitive system to teach students how to build such skills.

The importance of teaching planning skills gained prominence as early as the first quarter of the twentieth century. In fact, Alexander Luria, a Soviet pioneer in neuropsychology, developed a model addressing the specificity (modularization) of brain functions, including that of planning, decades before brain-imaging. Luria's early work, "A Child's Speech Responses and Social Environment" (Luria 1982), presented the concept that there were stages of child development and corresponding stages of brain development, which were dependent on a child's cultural



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experiences and schooling. Lev Vygotsky, a colleague of Luria's, championed the notion, based in neuroscience, that all children had the capacity to achieve, given enriching opportunities, in his masterful work *Thought and Language* (1934).



Founded on Luria's 1966 theoretical concept of two-coding units, termed simultaneous and successive, cognitive psychologists Das and Naglieri developed the Cognitive Assessment System (Das & Naglieri 1997), advancing what they called the "PASS" theory. The four interrelated cognitive processes (Das 2002) represented in the PASS construct are:

- **Planning:** the ability to make decisions about how to solve problems, which involves setting goals, anticipating consequences and using feedback
- **Attention:** the ability to selectively attend to stimuli while ignoring other distractions
- **Simultaneous Processing:** the ability to integrate separate stimuli into a cohesive, interrelated whole

- **Successive Processing:** the ability to integrate stimuli into a sequential order

The PASS model was one of the first to put the need for planning in a broader, conceptualized manner directly into an assessment and intervention model. This method, however, does not provide an instructional system to teach time management to students on a daily basis. As the 2010 Kaiser Foundation research indicates, the need for students to master planning and time-management skills has never been more acute.

Media influences and pressures today continually barrage students, pulling them in different directions and providing an abundance of opportunities for distraction. Without stable planning and time-management skills, students have so many elements competing for their attention that procrastination can become a habitual way of life.

Section Two

SO WHAT CAN WE CONCLUDE?

1. Although resources on time management and planning are in abundance, effective instruction in these areas requires students be guided to use a definitive system, if they are to fully develop their skills.
2. Students continue to be distracted by the abundance of media opportunities and pressures; without strong time-management and planning skill sets, many students are not equipped to deal with these pressures.

Section Three

EDUCATIONAL IMPLICATIONS FROM NEUROSCIENCE

It's amazing to think that just a little over a hundred years ago, educated people were consulting phrenology, the practice of using bumps on the head to determine personality characteristics, academic strengths, and numerous other qualities supposedly indicative of success and achievement throughout one's lifetime. Gradually, during the twentieth century, pioneering neuroscientists like Alexander Luria and Lev Vygotsky instead began studying people with specific brain injuries, as well as soliciting donated corpses to dissect brain tissue. We reap the benefits today of their advancements in understanding how the brain functions.

One of the most significant breakthroughs in neuro research appeared during the last decade of the previous century. With the development of brain-imaging and scanning mechanisms, neuroscientists can now study living, working brains. The use of fMRI (Functional Magnetic Resonance Imaging) allows us to see a live brain in action. Other recent technologies (diffusion-imaging, for one) are yielding more sophisticated, in-depth opportunities to study how the brain works. Some have termed this early part of the twenty-first



century the “age of the brain-mind” (Caine, R.N., Caine G., Klimek, & McClintic 2008). For educators, the age of the brain-mind is a golden age—a time when our profession could not play a more central and essential role determining the future of humankind.

With the benefit of brain-imaging techniques, science has confirmed many of Luria and Vygotsky’s theories about brain-functioning. Moving into the twenty-first century, educators and scientists are frequently joining forces to form a more comprehensive understanding of how the brain learns. For example, current research regards the prefrontal cortex area of the brain (frontal lobe area) as the chief coordinator of many higher-order procedures. Researchers often compare the frontal lobe area to the conductor of a grand and complex orchestra. As the conductor monitors and interweaves the sounds of various instruments, so, too, the frontal lobe area receives information from different parts of the brain and factors this information into actions and decisions. George McCloskey (2008) reported that each area of the brain is responsible for separate aspects of the overall production of the orchestra, working in a highly collaborative manner with the other areas.

Specific to the field of executive function skills and self-regulation, we have come to understand that development and maturation of these competencies seem to follow a spiraling sequence, resulting from family and cultural experiences within the child’s environment.

Section Three



Accordingly, the following developmental patterns are being identified:

- Executive function skills begin their development early in infancy.
- The maturation of executive function skills proceeds slowly, in the case of frontal-lobe maturation, continuing at least into early adulthood.
- Both biological and environmental factors contribute to their maturation.
- There is great variability in the maturation of executive function competencies related to context, motivation, and cultural concerns (Ylvisaker 2002).

SO WHAT CAN WE CONCLUDE?

1. New technologies in brain-imaging have provided neuroscientists and educators with a more complete understanding of how the brain works.
2. Students continue to be distracted by the abundance of media opportunities and pressures; without strong time-management and planning skill sets, many students are not equipped to deal with these pressures.
3. Executive function and self-regulation skills develop slowly from infancy through early adulthood. These skills are affected by biological and environmental factors.

Section Four

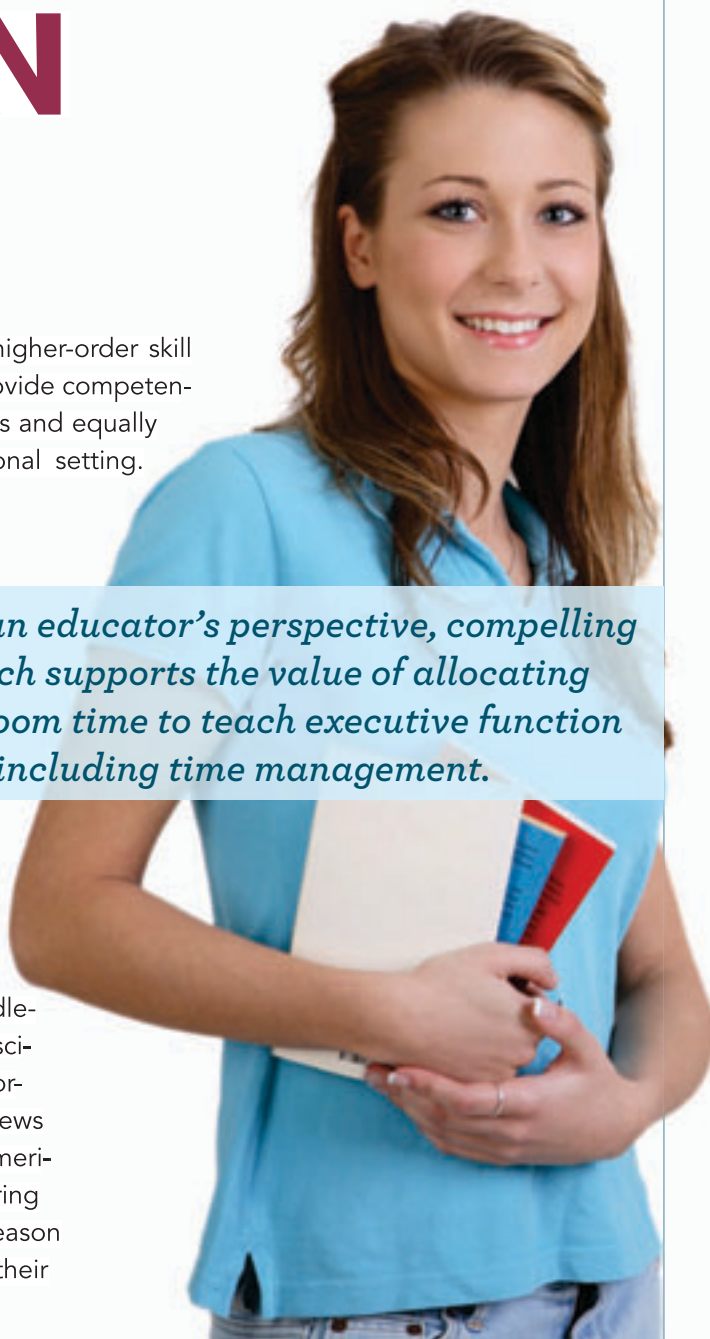
RESEARCH IN EXECUTIVE FUNCTION SKILLS

Several recent studies recognize a group of higher-order skill sets, termed “executive functions,” which provide competencies essential for success in academic pursuits and equally applicable to pursuits beyond the educational setting. These qualities include:

- goal-directed behaviors
- organizational skills
- time management
- self-regulation, including monitoring
- self-awareness
- strategic thinking
- problem-solving and cognitive flexibility

From an educator’s perspective, compelling research supports the value of allocating classroom time to teach executive function skills, including time management. According to a recent study of U.S. middle-school students, evidence of behavior indicates self-discipline was twice as reliable in predicting academic performance as IQ (Duckworth et al. 2005). Duckworth (Mathews 2006) said of this study, “Underachievement among American youth is often blamed on inadequate teachers, boring textbooks, and large class sizes. We suggest another reason for students falling short of their intellectual potential: their failure to exercise self-discipline” (p. 1).

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Other findings from Duckworth's study revealed that, compared with more impulsive peers, highly self-disciplined eighth-graders:

- earn better grades on report cards and higher GPAs;
- attain higher achievement and college-admissions test scores;
- gain admission to selective high schools more often;
- have fewer school absences;
- spend more time on homework
- watch less TV;
- start their homework earlier in the day; and
- start long-term assignments earlier in the project timeline.

In a related study, Duckworth and Seligman (2006) examined gender in relation to the ability to demonstrate self-discipline, defined in this study as "doing what one intends to do when a more pleasurable alternative beckons." Four areas of academic performance were listed as outcomes:

- studying for exams
- completing homework assignments and long-term projects on time
- preparing for class discussions
- sustaining effort and concentration despite boredom, fatigue, and innumerable distractions over the course of an academic year

While there was no significant difference in IQ based on gender, the girls in this study demonstrated significantly higher scores in measures of self-discipline. As in the earlier Duckworth study, self-discipline assessments were again represented by measures based on several executive function skills. The study again reported a statistically significant relationship between self-discipline skills and areas of academic performance.



For too long, educators have assumed that students will develop executive function skills by osmosis, based on modeling in the home or just naturally from everyday experiences. While studies within the field of special education have demonstrated strong success of specific instruction in planning, as well as the other executive function skills (Ylvisaker, M. & Feeney, T. 2002), only recently has research affirmed the benefits of teaching executive function skills in the regular classroom.

Results from recent studies (Carlson 2005, Duncan 2007) consistently show the relationship between proficiency in executive function skills and successful school performance; these studies support an adjustment within the educational setting. Recognizing the need to incorporate specific executive function instruction within the classroom, teachers seek evidence-based executive function programs that can be integrated into the regular education curriculum.

Many middle- and high-school teachers and administrators recognize the critical importance of addressing executive function skills (especially planning, organization, time management, and strategic thinking) in conjunction with covering the content inherent in each subject area. Parent and community groups have recently joined the outcry for schools to integrate the teaching of organization, time management, and strategic thinking into everyday curriculum. Lynn Meltzer (2007) makes an educational comparison between using executive function skills and serving a meal. Without executive functions, the food put before the diner might consist of the separate ingredients. It takes the executive function skills involved in following a recipe, combining ingredients according to instructions, to produce a tasty dish.

One might think that such a valuable skill set would surely have generated a well-developed, evidence-based, field-tested, teacher-friendly program years ago. However, as Greenberg (2008) notes, “Although there has been considerable interest in promoting self-regulation to improve behavior, little attention has been paid to how focused teaching regarding these executive function skills may be related directly to learning processes and academic achievement” (p. 5).



Section Four

SO WHAT CAN WE CONCLUDE?

1. Executive function competencies are essential for academic success.
2. Research has consistently shown a statistically significant relationship between self-discipline skills and academic performance.
3. Studies from the special-education field have demonstrated the value of teaching executive function skills. Recent research has affirmed the benefits of these skills in the regular classroom.
4. Research supports the value of allocating classroom time to teach executive function skills.

Section Five

THE EXECUTIVE FUNCTIONS PROGRAM

In response to this need for a classroom-based curriculum, the Educational Services Department of the Chicago-based Rush NeuroBehavioral Center (RNBC), an affiliate of Rush University Medical Center, developed an Executive Functions (EF) Curriculum series (Bozeday, Gidaspow, Minton, & Smith 2010). This EF series consists of a Primary Curriculum (kindergarten through second grade), an Intermediate Curriculum (third through fifth grades), a Middle School Curriculum and a High School Curriculum, utilizing a research-based framework combined with a classroom-based orientation. *The Executive Functions Curriculum series is centered on the neuroscience perspective that the frontal lobes hold the primary responsibility for the executive functions of working memory, maintaining attention, self-regulation (initiation and inhibition), planning and time management, and flexibility.*

The topics of the Executive Functions Program are designed as a sequential system with flexibility in terms of teaching order. The first unit group, the Foundational Units, is designed to enable students to have the organizational structures in place to start the school year.



The RNBC Executive Functions Program identifies the following areas as important for classroom instruction:

- self-regulation; the ability to efficiently manage time and materials
- self-awareness
- goal-directed behavior
- self-evaluation of performance
- flexibility to solve problems and revise plans

The topics include:

- Structuring the Learning Environment
- Managing Materials
- Managing Time

The second unit group, Study Strategies and Academic Support, represents higher-order topics that are more content-oriented. These include:

- Following Directions
- Memory Techniques
- Note-Taking/Organizing Information
- Test Preparation and Reflection

The third and final unit group, Personal Growth, addresses the executive function area of self-awareness. These include:

- Learning Strengths
- Goal-Setting
- Decision-Making

The second and third unit groups are designed to be taught in varying order, depending on the specific needs of the individual classroom/grade level/school. A more detailed explanation of each unit follows.

FOUNDATIONAL UNITS

- **Classroom Structure and Learning Environment:** Each classroom should be equipped with homework easels or dry-erase boards, monthly wall calendars, student supply centers, timers, daily agenda boards, and organizational models.
- **Materials Management:** Students utilize the executive function materials organization system, which may include the following: notebook/binder system or a book bag, containing materials to keep subject documents organized, such as double pocket folders or color-coded single pocket folders, and a planner. These components together create a system for homework success.
- **Time Management and Planning:** Each classroom should be equipped with a large monthly



wall calendar for recording important due dates, tests and quizzes, holidays, special events, etc. The EF classroom features a “sample planner” listing all assignments, which in particular benefits a student who has been absent. Students are taught skills integral to prioritization as they work through yearly, monthly, weekly, and daily planning of school and personal events in their planners. Teachers and students engage in task analysis, breaking down long-term projects and assignments and then mapping these projects out in the planner. Depending on the grade level, a colored flag system and/or “to do” list strategy is modeled and implemented. A visual timer is displayed in each classroom for class activities and for use during transitions. Understanding time parameters also benefits preparation efforts for standardized testing and regulating time constraints.

Within the context of executive function skills, time management and planning stand out as having wide-based applications and far-reaching implications for student success.

The RNBC Executive Functions Program unit titled “Time Management and Planning” includes the topics of prioritization, task analysis, and an analysis of individual

time usage based on completing a time log. This unit begins with the overall topic of “Using a Planner,” which includes understanding how a good planner is organized and the full range of its capabilities. After researching different planners produced by several companies, the RNBC Executive Functions Program recommends using the Premier™ planner (School Specialty 2010) that incorporates The 7 Habits of Highly Effective Teens® (Covey 1998) into its content.

Academic success is dependent to a large extent on the consistent application of skill sets in time management and planning. The RNBC Executive Functions Program is heavily reliant on consistent implementation of this student planner. We recommend that all students have Premier™ planners, that the teacher keeps a Premier™ planner to use as a model for the classroom, and that certain aspects of curriculum and instruction be incorporated directly into the Premier™ planner. Accordingly, time management and planning are integral to several lessons in the Executive Functions Program, e.g., developing a study plan, setting goals and developing action plans.

Overall, the larger-sized Premier™ planner is advisable through middle school. High school students tend to prefer the smaller size. Many of the Premier™ planners for high school maintain most, if not all, of the important design features mentioned below. The characteristics of the Premier™ planner that make it especially well-suited as a companion to the Executive Functions Program are:

- a monthly calendar preceding each month
- a weekly view when a subsequent page is opened
- ample room within each space for writing assignments
- preprinted major subject areas
- preprinted days of the week and dates

- each day’s assignments listed vertically by day of the week
- a dedicated goals section on each week’s days
- space to indicate after-school activities
- a small space for students to note weekend activities

Based on our experience teaching the Executive Functions Program in regular classroom settings, time management is cited by students at all grade levels as the most critical aspect contributing to academic success.



After completing lessons in the EF Program related to time management and planning, students often experience an “aha” moment regarding their past habits relative to time management and planning. Working with the Premier™ planner within this essential skill set aids in making the process more connected to the coursework expectations.

SUBJECT-AREA CONTENT UNITS

Study Strategies and Academic Support: Students are reminded of the importance of maintaining a reserved

study time on a daily basis (Dickinson 1990). Following oral and written directions, memory strategies, note-taking, and test preparation are included in this unit. Assistance in these areas, including guidance on how to develop a study plan, reduces anxiety relative to the management of the student's schoolwork load. Additionally, academic support references are included, organized according to the subject areas of reading, written expression, and math.

PERSONAL GROWTH UNITS

Understanding Learning Strengths:

A learning strength inventory is included in the Executive Functions Program. Teachers and students are encouraged to highlight learning strengths while striving to improve areas of challenge based on students' learning preferences.

Goal-Setting: Teachers are encouraged to guide students in setting achievable weekly classroom goals. Students learn how to set SMART (Specific, Measurable, Achievable, Relevant, and Time-Based) goals, both academic and personal, and then break them into smaller "Action Steps" according to a plan.

Decision-Making: Students receive instruction on the problem-solving process. Activities are included to help students be more thoughtful in their decision-making experiences, for both long-term and immediate scenarios.



Section Five

SO WHAT CAN WE CONCLUDE?

1. The Executive Functions Curriculum Series is founded on neuroscience; specifically that the frontal lobes hold primary responsibility for the executive functions of working memory, maintaining attention, self-regulation, planning, time-management, and flexibility.
2. Classroom instruction focuses on self-regulation, self-awareness, goal-directed behavior, self-monitoring, and flexibility to solve problems and revise plans.
3. Academic success is dependent on the student's consistent time-management and planning skills. The RNBC Executive Functions Program uses the Premier™ student planner to aid students in developing a study plan, setting goals and developing action plans.

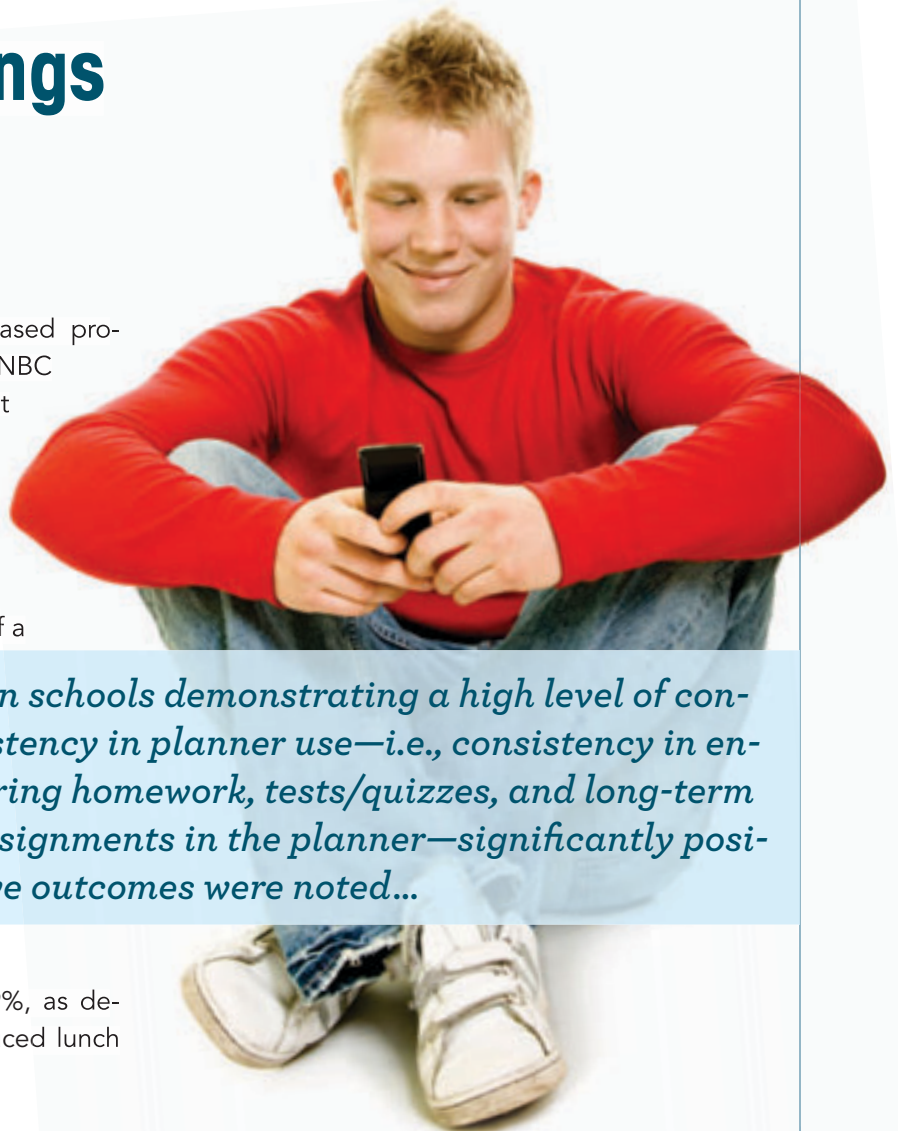
Section Six

THE EXECUTIVE FUNCTIONS PROGRAM:

Research Findings

In order to establish an evidence-based program for executive function skills, RNBC contracted Dr. Scott Leon, Assistant Professor at Loyola University and a research psychologist, to study the efficacy of the Executive Functions Program. Students in fourth through eighth grades from several Chicago-area schools, public and private, were included as part of a five-year study. This research effort focused on adherence to the materials and time-management aspects of the program. Program adherence data was correlated with grades earned in the subject areas of reading and math, as well as performances on standardized reading tests. The vast majority of the schools had poverty-level demographics between 85% and 99%, as defined by participation in the free and reduced lunch program at school (Leon 2008).

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RATE OF HOMEWORK COMPLETION AND SUBJECT-AREA GRADES

Not surprisingly, students who performed well in the RNBC Executive Functions Curriculum had a significantly higher rate of homework completion and earned, on average, one to two grades higher than those not performing at the higher levels of adherence to the EF Program, as measured in math and reading.

However, in schools demonstrating a high level of consistency in planner use—i.e., consistency in entering homework, tests/quizzes, and long-term assignments in the planner—significantly positive outcomes were noted.

ADHERENCE TO THE EXECUTIVE FUNCTIONS PROGRAM AND ACADEMIC CORRELATIONS

Students in the four schools included in this study during the 2006-07 school year demonstrated a high degree of adherence to the foundational components of the materials management segment of the program. Put in terms of “meets and exceeds” expectations, these are the overall averages for the schools in the area of materials management: 100% of students had their binders at school; 95% of those binders were set up appropriately with labeled dividers for the subject areas; 82% of students used the front divider pocket correctly; 86% used the back pocket correctly; and 86% used the notes pocket correctly. Students in grades six through eight who performed at the “exceeds level” in maintaining subject pocket organization scored significantly higher on the spring reading Illinois State Achievement Test (ISAT).

In the area of planning and time management, adherence to maintaining the planner, as measured by consistent entries for homework, tests and quizzes, and long-term projects proved more challenging to stabilize.

In an effort to study the effects of performance on the EF Curriculum with standardized reading tests (spring ISAT, Illinois Standards Assessment Test), Dr. Leon classified students into one of two categories across the major components of the EF Curriculum: “above threshold” or “below threshold.” Students who were “above threshold” demonstrated consistent performance mastery of the material over time, whereas students who were classified as “below threshold” did not consistently put the EF Curriculum into practice.

The study results indicated that students who were “above threshold” in organizing, as measured by entering upcoming homework assignments as well as tests/quizzes and long-term projects in their planners, experienced 15% to 25% higher test performances in grades six through eight, compared to students who were “below threshold.” These results were statistically significant at the $<.05$ level. It is important to note that this effect was achieved after statistically controlling for demographic variables and standardized test scores from the prior year, lending more credibility to the hypothesis that adherence to the EF Curriculum is strongly associated with improved standardized test scores.



PROGRAM SATISFACTION

Students, parents, and faculty expressed satisfaction with the RNBC Executive Functions Curriculum. Survey satisfaction percentages ranged from 88% to 95% as measured by ratings of 4 or 5 on a 5-point scale. Student comments included:

- “I became more organized this year using the binder system. I didn’t lose my homework as much.”
- “I take better notes now. I can listen to the teacher and take notes at the same time; I couldn’t do that before. It (the EF Program) helps me study better.”

The following quote from a Chicago-area parent of a middle-school student represents the high level of support expressed by parents for the Executive Functions Program:

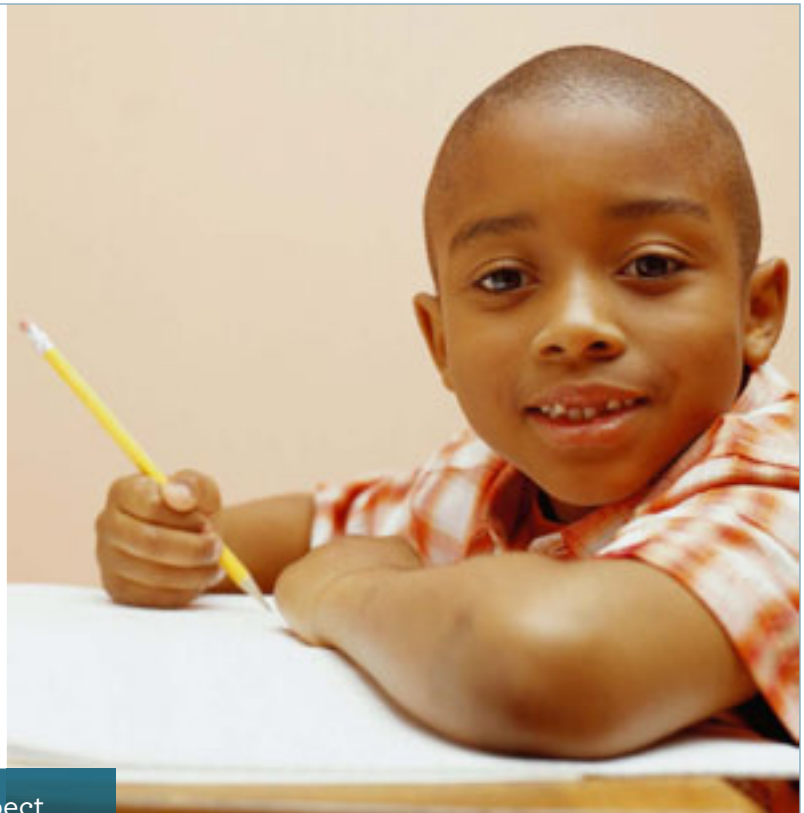
“As teachers and parents, we expect our children to handle multiple, complex academic and personal expectations, but we never teach them how to achieve that goal. Finally we have a well-designed, research-based program to help teachers and parents apply specific instruction in executive function skills in the classroom, with guidance provided for parents to support the program at home.”

ACADEMIC ORGANIZATIONAL BEHAVIORS

Students demonstrate a real “pride of ownership” regarding the EF Curriculum.

Across age and schools, students almost universally participate in several core features of the curriculum, including the following:

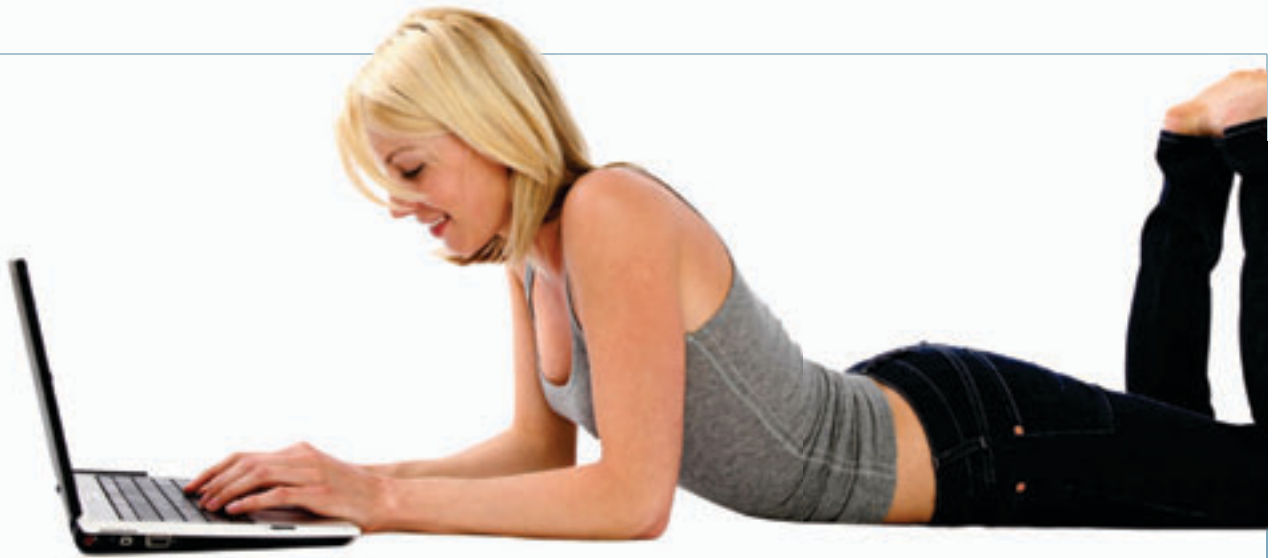
- They arrive at school with binders on a daily basis.
- They use separate dividers for each class, as directed by the EF Curriculum.
- They have class names clearly written on dividers.
- Students offer information conveying the importance of utilizing planning and time-management skills, including using the planner consistently.



INTEGRATED INTO REGULAR EDUCATION CURRICULUM

The RNBC EF Program is unique for a curriculum of its kind. This program is structured to facilitate integration into the broader educational curriculum within the classroom. For example, when learning about timelines in history class, the students learn about the importance of making timelines in the EF Curriculum. The integrated component has led to measurable improvements in the students’ adherence to the curriculum. This aspect of the RNBC Executive Functions Program is in step with current research directed at closing the achievement gap identified in different studies according to ethnicity or socio-economic levels.

Focusing on closing the achievement gap between schools serving well-resourced populations and those serving under-resourced populations, Ferguson (Flaxman 2003) found that schools serving under-resourced populations need to provide more educational resources and learning experiences because of student differences in advantages due to their family background.



Educators who have implemented the RNBC Executive Functions Program recognize the urgency of teaching planning and the other executive function skills within the regular classroom experience. As a design feature, this Executive Functions Program follows the SAFE (Sequenced, Active, Focused, and Explicit) model for

staff development, cited in research as the most effective format leading to consistency in demonstrating new practices for working with faculties in educational institutions (Durlak 2009).

Section Six

SO WHAT CAN WE CONCLUDE?

1. A five-year study in Chicago-area schools formed the basis for research on the RNBC Executive Functions Program.
2. Research focused on adherence to the materials and time-management aspects of the RNBC program.
3. Schools that demonstrated a high level of consistency in planner use—i.e., consistency in entering homework, tests/quizzes, and long-term assignments in the planner—showed significant positive outcomes in the study.

Section Seven

EXECUTIVE FUNCTION SKILLS:

Suggestions for the Classroom

At this juncture, it would seem to be nearly impossible to overstate the importance of teaching executive function skills in a specific and direct manner within the classroom. Vygotsky (1934) wrote of the importance of parents and teachers to “scaffold” instruction in organizing and problem-solving processes in order to provide playful and specific instruction when the child is younger, then lead the child/student into an increasingly independent application of executive function competencies (Ylvisaker and Feeney 2002). For this reason, the RNBC Executive Functions Program features a spiraling design, revisiting EF topics in more complex and challenging lessons at ascending grade levels.

The EF Program recognizes that each teacher has the final word regarding what best fits his/her students, according to: age/grade level, current development of competencies, the place these suggestions fit relative to similar material previously taught, cultural influences, school climate, and community environment. These “tips” are structured using the same Executive Functions Program topics represented on page 15 and are taken directly from the Executive Functions Program lessons. Teacher modeling remains one of the most effective means of promoting each strategy in the classroom.



Tips for the Classroom	
Goal-directed behavior	After leading a class discussion on goal setting using the SMART goals framework, help students formulate a class goal that meets the SMART criteria. As a group, construct a system/rubric to measure progress on this goal. Determine how the class will celebrate when the goal is met. Monitor and report progress at regular intervals.
Self-monitoring with feedback	Facilitate students writing individual SMART goals, including the specific methods that will be used to provide feedback and measure progress. Establish a way to celebrate when the goal is met.
Self-regulation, including efficiently managing time and materials	Assist students in setting up systems to help them manage their materials and time. Help students anticipate possible challenges as they work to maintain these systems, including revisions as needed.
Self-awareness	Provide students with ways to learn about their own learning strengths. Once determined, help students approach tasks, selecting methods for studying and designing projects that best fit their unique learning strength profiles. For example, a visual/spatial learner might create a movie or tell a story via a storyboard, based on an assigned reading selection.

Underscoring the critical nature of the school's role in developing executive function skills, Lynn Meltzer (2007) writes that in today's classrooms, "... students are not taught these executive processes systematically, and classroom instruction tends to focus on the content or the what of learning, rather than the process or the how of learning, leaving many students overwhelmed and frustrated" (pp. 165-166).

In a later chapter in *Executive Function in Education* (Meltzer 2007), Gaskins and Pressley provide a list of "metacognitive goals" (p. 262), described as representative of competencies evident in those who demonstrate a high level of proficiency with executive function processes, as measured by the ability to apply these skills in novel situations.

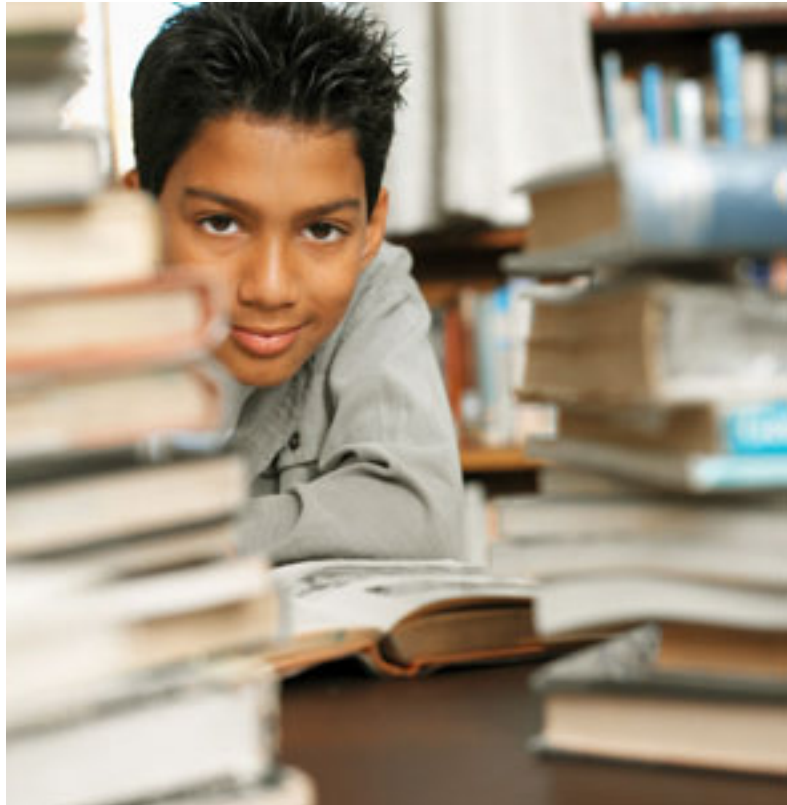
These abilities are:

- **Know strategies, including when to use them and why they are helpful, and initiate action based on this knowledge.**
- **Know academic success is the result of smart effort and put this knowledge to work.**
- **Know how to monitor and use strategies flexibly and take initiative to apply this knowledge.**
- **Know a lot of important ideas related to content areas and use this knowledge to generate and recall other important ideas.**
- **Know how the mind works with respect to thinking and learning and use this knowledge to maximize learning.**
- **Know that applying knowledge and strategies is more important than biology, and take action to use these knowledge and strategy assets to overcome any perceived deficits.**
- **Know the importance of active involvement and reflectivity and put this knowledge to work to set and protect goals and apply strategies.**
- **Know themselves as learners and what works for them and initiate actions based on this knowledge (pp. 262-266).**

Even though the vast majority of current writing and research focuses on students in middle school, high school, and even those of college age, there seems to be a resurgent interest in examining self-regulation, planning, and other executive function skill areas at the preschool level. Emphasis for young children is placed on relating the findings to developmental and behavioral patterns throughout childhood, then making connections with how these patterns progress into adolescence and young adulthood. A recent landmark study of preschoolers by Adele Diamond (2007) examined self-regulation and problem-solving within the world of three- and four-year-olds.

Dr. Diamond confirmed the belief that the ability of young children to control their emotional and cognitive impulses is a strong indicator of success in school and later in life. Her studies demonstrated at the preschool level that the correlation between self-regulation skills and academic achievement is a more reliable predictor of academic success than IQ (Diamond 2007). In an article titled, "Can the Right Kinds of Play Teach Self-Control?" Paul Tough (2009) writes of one recent national survey in which 46% of kindergarten teachers said that at least half the students in their classes had problems following directions. In a separate study, Tough discovered that Head Start teachers reported that more than a quarter of their students showed serious difficulties with issues of self-control, including behaviors like kicking. Finally, Tough cites the research of Walter Gilliam, a professor at Yale's child-study center, who estimates that each year more than five-thousand children are expelled from prekindergarten programs because their behavior is evaluated as out of control.

Quite remarkably, four decades before Diamond's work, Dr. Walter Mischel (Lehrer 2009) sought to measure the correlation between the ability to delay gratification in young children and young adults, and academic success. Dr. Mischel began the study by measuring the wait time of four-year-olds relative to eating a marshmallow put in front of them or delaying gratification and receiving an additional marshmallow as a reward. He followed up with



the same two groups of students thirteen and fourteen years later by gathering their scores on the SAT college-entrance assessments. He found significant differences in the average SAT scores of the two groups.

Dr. Mischel continues to follow these subjects throughout adulthood relative to their attainments in educational level, income, family life, and career achievements. Results show that significant differences between the groups persist into adulthood. Mischel's study led to labeling two distinct groups according to behavior: The Impulsive Group (four-year-olds who could not wait) and the Controlled Group (those who delayed gratification). Of particular interest to Dr. Mischel in this research are the following two areas:

- What strategies did the Controlled Group employ that helped them wait the full time without eating the marshmallow?
- What characteristics typify those students from the Impulsive Group who achieved higher levels of success across several indexes as adults?

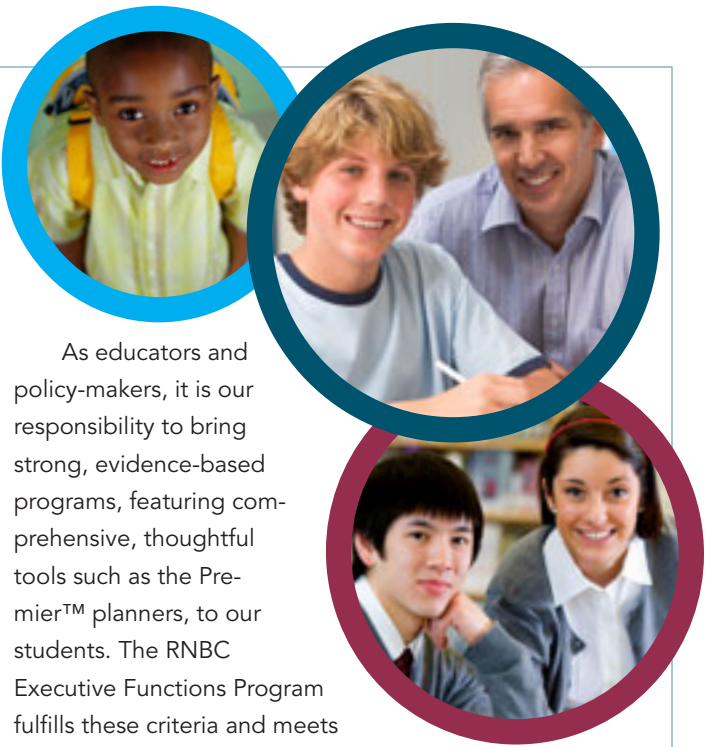
Conclusions

Clearly, providing specific instruction in executive function skills (with emphasis on planning, time-management, and strategic thinking) is critical to student success, especially in our media-driven, multitasking twenty-first century life. The RNBC Executive Functions Program is designed to match best practices in establishing these essential skills to meet the needs of our students from kindergarten through college. The program has been successfully implemented in more than thirty school systems to date (public and private, urban and suburban) in the Chicago metropolitan area.

Many EF Program schools have utilized state and federal funding designated for RTI Tiers I and II. Acquiring funding for the RNBC Executive Functions Program is based on the fact that the program addresses instruction in skill sets needed for all students within the school (Tier I RTI), as well as providing tools for use by problem-solving teams addressing difficulties of specific students (Tier II RTI). Additionally, No Child Left Behind funding also fits components of the EF Program. Schools have also successfully applied for Title I funding to support implementation of the EF Program.

Each of these funding categories can be applied to the RNBC Executive Functions Program due to its research-based framework and the extensive field-testing which strengthens the design of the lessons and units. Working through the EF lessons, students learn to master organizational, planning, and time-management skills at the foundational level, as well as higher-order metacognitive skills, or note-taking and memory enhancement, at the strategic-thinking level.

The EF Program operates within the neuroscience perspective of executive function skills, assisting students to developing the ability to reflect on the past, relate the past to present-day events, and then move this learning to project and plan for the future. The twenty-first century demands placed upon our students already require them to demonstrate in-depth skills in order to function well, especially in areas of problem-solving and creative thinking, both of which generate innovation. Paraphrasing Einstein, our students must learn to use executive function skills to employ critical reasoning for problem-solving in a different manner from the thinking that created the problems in the first place.



As educators and policy-makers, it is our responsibility to bring strong, evidence-based programs, featuring comprehensive, thoughtful tools such as the Premier™ planners, to our students. The RNBC Executive Functions Program fulfills these criteria and meets the learning needs of twenty-first century students. Additionally, educators in charge of staff and curriculum development must keep an ever-vigilant eye toward providing contemporary students with the necessary life skills that promote increased confidence, resourcefulness, problem-solving competency, self-advocacy, and productivity.

Using the RNBC Executive Functions Program to develop these essential life skills, incorporating planning and time management throughout, empowers twenty-first century students to succeed in school at all levels. Additionally, mastery of executive function skills is essential to meeting career expectations and managing projects of all types in all fields of work. After all, executive function skills facilitate learning on all levels and learning facilitates change in all aspects of one's life. Ultimately, mastery of executive functions is necessary to achieving a fulfilling and productive life, one that promotes the well-being not only of the individual, but of the greater society as well.



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