

# Understanding Executive Functions



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## Agenda

- Executive Functions
- Strategies & Supports

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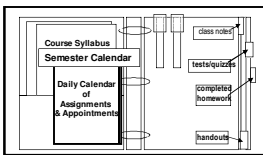
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## Executive Functions

I find that I have difficulty with keeping my master notebooks organized because the commitment is a term-long one: at the end of each class, when teachers distribute handouts or assignments, I'm usually so anxious to be out of class that I shove the papers into a stack outside of the binder rings, so I just have this giant, intimidating stack of papers. Once papers begin to go out of place, the situation will most likely worsen and worsen ...



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## What is “executive function” ?

Brain’s management system working together to regulate different areas of cognitive processing.

- Planning and Sequencing, Paying attention to several different components at once, Grasping the gist of a situation, Resisting distraction and interference, Inhibiting inappropriate response tendencies, and Sustaining behavioral output for a sustained period of time (Stuss & Benson, 1986).

- Self-directed actions that are used to self-regulate:

- Control
- Timing
- Persistence
- Flexibility
- Goal-directed actions

(Barkley, 1997)

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## Executive Functions

Barkley’s Model of Executive Functions

Executive Functions Affected in ADD Syndrome

### 1. Nonverbal working memory

- Holding events in mind, hindsight & forethought, self-awareness, sense of time.

### 2. Internalization of speech (verbal working memory)

- description & reflection, self-questioning & reflection, rule-governed behavior (instructions), generation of rules & meta-rules, moral reasoning, and reading comprehension.

### 3. Self-regulation of mood, motivation, & level of arousal

- self-regulation of affect, objectivity/social perspective taking, self-regulation of motivation, self-regulation of arousal in the service of goal-directed action.

### 4. Reconstitution (break down behaviors into component parts & recombine into new behaviors in pursuit of a goal)

- analysis & synthesis of behavior, rule creativity, goal-directed behavioral creativity & diversity, behavioral simulations, syntax of behavior.

Barkley, R. A. (1998). Attention-Deficit Hyperactivity Disorder. *Scientific American*.

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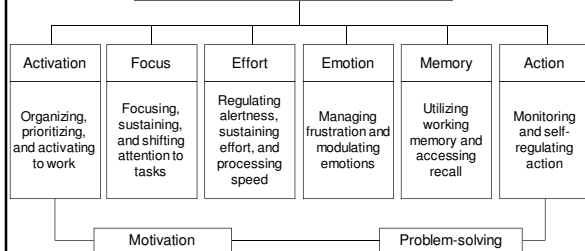
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## Executive Functions

Executive functions  
(work together in various combinations)



Adapted from Brown, T.E. (2001). Manual for Attention Deficit Disorder Scales for Children and Adolescents.

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## Potential Executive Function Challenges

### Activation

- Poor organizational skills
  - Inability to organize and store materials, paperwork, bills, notes
  - Lost paperwork, assignments, textbooks, supplies, notebooks, etc.
- Difficulty prioritizing and activating
  - Keeping up with paperwork, materials, assignments, papers, and projects
  - Deciding which tasks are more important
  - Trouble starting and finishing tasks

### Focus

- Difficulty sustaining attention
  - Inconsistent work quality
  - Inconsistent focus
  - Distractions that pull attention away from tasks or learning
  - Gaps in understanding or learning due to inconsistent attention
- Difficulty shifting attention
  - Inconsistent performance from task to task
  - Inconsistent quality within tasks that require multiple steps to complete

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## Potential Executive Function Challenges

### Effort

- Difficulty sustaining effort and alertness
  - Incomplete tasks
  - Poor work habits
  - Frequent drowsiness when not engaged
  - Poor sleep hygiene, even for college students
  - Lack of motivation
- Slow processing
  - Tasks take excessive time to complete
  - Easily fatigued
  - Poor written output

### Emotions

- Low threshold for frustration
  - Irritability
  - Angry outbursts
  - Inability to accept another's point of view
  - Constant arguing
  - Hypersensitive
- Difficulty regulating emotions
  - Insensitivity to others
  - Disproportionate emotional response to the comments or actions of others
  - Moodiness
  - Difficulty "letting go" or "moving on"

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## Potential Executive Function Challenges

### Working Memory

- Chronic difficulty holding and processing current information
  - Difficulty holding onto relevant thoughts in order to express them in discussions
  - Interrupting others due to fear of losing a thought
  - Difficulty recalling information in test situations
  - Reading comprehension gaps
  - Difficulty with writing tasks

### Action/Self-regulation

- Impaired ability to self-regulate
  - Inappropriate comments in social situations
  - Inability to monitor how others perceive them
  - Difficulty slowing down
  - Difficulty following directions
  - Impulsive acts

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## Attention, inhibition, motivation, & memory

Prefrontal Cortex:

- focus, judgment, decision-making, planning

Caudate nucleus:

- rich in dopamine receptors
- filters out unwanted information
- responds to task feedback & more so with successful learning
- works with Thalamus for automatic inhibitory motor control

Hippocampus:

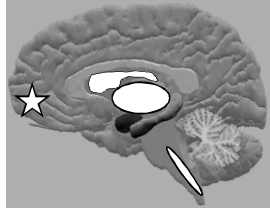
- Memory formation

Amygdala:

- Emotion center

Reticular Formation

- stimuli filter



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## Strategies versus Skills

- Low-order and high-order processes compete for cognitive working space. For example, concentrating on spelling or mechanics vs. analyzing the validity of ideas as they relate to a central thesis.

- Constrictors of cognitive working space include:

- Language deficits.
- Weaknesses in memory, attention or executive functions.
- Poorly automatized skills.
- A



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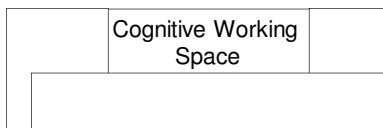
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## Strategies AND Skills

Skills and strategies increase cognitive working space:

- Automaticity of skills;
- Effective strategy use;
- Confidence and other affective issues.



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### Strategies versus Skills

- Low-order and high-order processes compete for cognitive working space. For example, concentrating on spelling or mechanics vs. analyzing the validity of ideas as they relate to a central thesis.

- Initiate (focus & action)
- Sustain (focus, effort, positive emotion, & memory)
- Inhibit (distractions & impulses)
- Shift (focus, effort, & activation)


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### Executive Functions

Emotions create meaning and drive attention, memory and motivation.

- "...many more connections from the small emotional limbic center into the large logical and rational cortical centers than the reverse....why we sometimes react or speak before we think." — John Ratey, *A User's Guide to the Brain*
- "Working memory is the gateway to subjective experiences, emotional and nonemotional ones...." — Joseph LeDoux, *The Emotional Brain*
- "The intensity with which you attend to such stimuli is determined by your own level of interest, alertness, and anxiety. The cognitive process of assigning an emotional weight to perceptions affects attention as well."  
(Ratey, 2001, *A User's Guide to the Brain*, p.114)
- "As long as the degree of emotional arousal is moderate during memory formation, memory is strengthened. But if the arousal is...highly stressful, memory is often impaired." (LeDoux, 2002, *Synaptic Self*, p. 222)


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### Executive Functions

- "...the ability to emotionally label certain stimuli or situations...is really the center of motivation. Weighing our feelings for or against something determines our movement toward or away from it." (Ratey, 2001, *A User's Guide to The Brain*, p. 248)
- "Emotions engage meaning and predict future learning because they involve our goals, beliefs, biases, and expectancies." — Eric Jensen, *Teaching with the Brain in Mind*
- Individuals who experienced negative emotionality had slower cognitive processing and when experienced making a mistake or being told they had made an error, slowed down even more in their cognitive processing time on problem-solving tasks.
- "It is possible that those with good inhibitory control are skilled at planning and pursuing long-term objectives, partly because they can keep those objectives in mind and suppress the irrelevant thoughts and feelings."  
— Fernandez-Duque, Baird, & Posner, 2000
- "older college students tend to manage stress by using task-oriented behaviors...by contrast, younger college students tend to manage stress by using emotion-oriented strategies or avoidance" — Kariv & Heiman, 2005


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## Executive Functions

- "The combination of repeated failure to complete tasks on time and being told by friends and family in so many words that success was not my path led to struggles with persistence. I was often the brunt of many jokes around my peers as they would ridicule me for saving everything until the last minute, arriving late to group gatherings, and asking for extensions in the classroom. I was often called "the biggest procrastinator" that they knew. I was constantly internalizing all of my faults and failures, which created a lack in persistence because it could not sustain itself. - Landmark College Student
- "I realized how intertwined each of the categories (emotion, motivation, memory, attention and perception) really are. If you can begin to change one of them around, then they can all go in that direction. Unfortunately, for so many students, they are intertwined in a negative manner. At the moment I am looking forward to keeping up a positive connection between them all and growing and working on it day by day." - Landmark College Student

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## Executive Functions

- "I can become easily overwhelmed emotionally and this definitely has created problems for me academically. I can become easily overwhelmed by large amounts of work. I end up freezing, and instead of being able to do things step by step, I can't do anything."  
- Landmark College Student
- "I had trouble regulating emotions, and it was often difficult for me to understand and explain to others, especially my parents, why I was upset or angry. Because of this, I frequently shut down while talking about my own emotions and also had trouble focusing on anything other than my emotional state when I was emotionally distraught."  
- Landmark College Student

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## Executive Functions

I definitely struggle with perfectionism as it pertains to my papers. I will work on an assignment, reach a block, and put it away. Then, I will begin an avoidance pattern with the teacher and the paper, and I will end up either not turning anything in or turn something in way past deadline that I finally finished according to how I wanted it to look.

At times, the problem is that I don't do the actual writing, but only theoretical conceptualization in my head. Most of the time, however, I will begin the assignment but never finish it and am too scared and busy to pick it up again.

I learned new strategies to address this issue: begin working on the assignment when the instructions are fresh in my mind and break down the assignment into smaller, detailed pieces.

~Landmark College Student

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## Executive Functions

- Selective Attention for learning & retention requires sustained effort & energy.
- Work together to motivate, evaluate, synthesize, associate, organize and connect information to be stored into short-term & long-term memory.
- Controlled by specific brain structures & neurotransmitters.
- Influenced by hormones, stress and emotion.

### Implications for Learning:

- Need to be actively involved.
- Need to explicitly know what to skim.
- Need to know what to deeply focus on.
- Need to regulate external distractions.
- Need to regulate internal distractions.

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## Executive Functions

Difficulties can lead to

- Poor self-concept
- Inconsistent focus/motivation – attracted by idea of instant gratification
- Difficulty transferring skills across contexts
- Overwhelmed by prioritizing and sequencing – everything has equal importance
- Inconsistent performance
- Difficulty meeting deadlines – break down at point of performance
- Organizational difficulties
- Memory difficulties
- Difficulties with social interactions

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## What You Can Do

1. Take an inventory of academic strengths and weaknesses with the student.
2. Encourage two core courses for general education requirements in two different disciplines and two courses that the student thinks sound new and interesting.
3. Encourage the students to avoid taking too many courses in the first year that they just want to "get through." The result can be a frustrating and boring first year – not a good mix for students with EFD.
4. Familiarize yourself with faculty teaching and assessment styles and inform students.

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### What You Can Do

1. Understand & educate of what the research shows about executive functions.
2. Maintain and support patience and a positive attitude.
3. Form and/or participate in support groups or mentorship relationships.
4. Support and model self-regulation.
5. Establish routines that provide variety.
6. Experiment with & Utilize technology aids .
7. Initiate and facilitate communication.
8. Increase visual aids (supplement the auditory).
9. Increase kinesthetic activity.
10. Encourage reflection/meditation.

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### 1. Offer / Find Support

- Establish a relationship of mutual respect
  - Explain how your expectations reflect what you value most
  - Adopt a neutral, non-judgmental approach to interacting with individuals
  - Coach individuals to find their own rewards and reflect on what motivates them
  - Approach failure as an opportunity for learning
- Success breed success
  - Create tasks that allow individuals to achieve some immediate goals
  - Vary the complexity and types of tasks to accommodate multiple learning styles
- Use a variety of assessment formats to measure progress
- Plan sessions of "mutual" work
- Modify the environment

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### 1. Offer / Find Support

- Students who believe that intelligence & the ability to learn can be experienced & enhanced through effort & experience over time are more likely to use strategies of:
  - effort regulation
  - managing time and study environment
  - peer learning
  - help-seeking behavior

• (Paulsen & Feldman, 2007)

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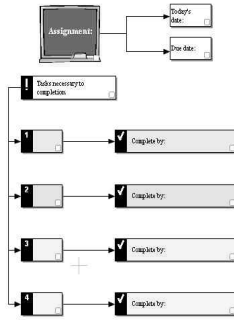
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## 2. Provide / Establish Structure

- Try and see different models of planning systems (VISUAL)
  - Daily planner for tracking assignments
  - Computer based planners
    - Email/Outlook/Groupwise
    - PDAs
    - Inspiration Software
  - Task Agendas:
    - Daily and Weekly
  - Spend 5-10 minutes per day at the beginning AND the end to record, track, and prioritize tasks



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## 2. Provide / Establish Structure

- Goals are clearly stated and available in multiple formats (on paper, on calendar, refrigerator, bathroom mirror, computer, on website, on CD, on Phone)
- Break long term tasks into component parts with due dates for each part & check-ins of accountability to someone/self
- Review progress frequently (best with someone) and make adjustments to strategies that don't work
- Use self-assessment rubrics to clarify what is expected
- Design for "TIME ON TASK" =
  - Students "work" during class time
  - Specific bill paying time, housecleaning time, medical appt. time, vet visit time
  - Explicitly model and experiment with a wide array of skills and strategies (one size does NOT fit all)

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## 3. Incorporate Novelty

- Design for Visual, Auditory, Tactile, Kinesthetic engagement
  - Promotes more activity and engagement through the use of multiple senses
  - Include a visual component with auditory info.
  - Promote innovation - note taking through collaboration and modeling
  - House cleaning games
- Design Action-based work session
  - Walk and talk reviews of project work/paperwork, group discussions, problem-solving activities, project planning and design, student designed assessments, real-world applicable projects, models, public presentations (share progress updates),
- "I want to thank you for giving us an opportunity to teach ourselves. The way you gave us different options to do our work definitely made the process of doing assignments more interesting and entertaining." ~ Landmark College Student

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#### 4. Identify Expectations

- Start with clearly and simply stated outcomes & how you will FEEL and how other party will FEEL if outcomes are met or not met (located in multiple places/in multiple formats)
- What must absolutely be done by you, versus permission to ask others for assistance/support
- Create a visual check list of possible action choices based on several obstacle-ridden scenarios
- Set and stick to a policy on work deadlines
- How will you track progress (concrete milestones)
- Have students create a rubric or provide and use rubrics that have clearly stated/measurable outcomes for assessing student work

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#### 5. Support Metacognition

- Be sure that both you and individual understand role of metacognition in self-regulation and motivation.
  - Foster metacognition in all tasks.
- "academic metacognition [is] a construct comprised of three major elements:
- (a) active control over ...when, how much, and with whom a student is learning;
  - (b) self-regulation of motivation and affect, ...control over their emotions and even use them in goal setting;
  - (c) control over various cognitive strategies for learning, such as rehearsal and memory strategies"
- (Pintrich, 1994 as cited by Trainin & Swanson, 2005)

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#### 5. Support Metacognition

- I have developed a setting that allows me to write and create flowingly and productively. I put myself in a classroom setting (basement of Frost), put techno music on my iPod in my noise-canceling headphones, turn off the internet on my computer and my cell phone, close the door, and focus. This system allows me to block out any and all distractions from my work. However effective, this state is relatively fragile. I make such an effort to block out distractions that when they arise, my attention magnetizes to them instead of my work. For example, I find that if I don't have all of the "guidelines" or directions for an assignment immediately in front of me, then I have to stop everything and find them. Similarly, if somebody comes into the room and wants to chat for a minute, it completely sidetracks me and, being so desperate for a distraction from my work, it allows me to begin justifying the halt on work and the beginning of a new activity. ~ Landmark College Student

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## 5. Support Metacognition

An effective coaching process uses carefully constructed questions AND active listening to get the INDIVIDUAL to:

- identify the issue
- describe realistic minimum and maximum goals
- trouble-shoot potential pitfalls & back up plans
- build in accountability
- record and track action items
- identify, record and track progress/success

Effective Listening is Listening for:

- Accuracy
- Empathy
- Discovery
- Learning
- Action

Ineffective Listening is Listening:

- To reassure
- To blame
- To fix
- To tell your opinion

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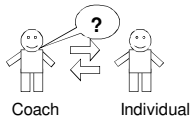
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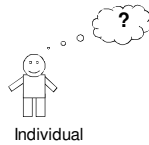
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## 5. Support Metacognition

External Process Questions → Internal Process Questions



Coach generates process/thinking based questions for individual to trigger problem-solving



Goal is to eventually have Individual self-generate process/thinking-based questions

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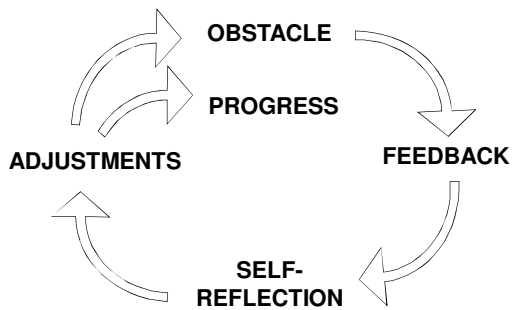
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## 5. Support Metacognition

Wrong Questions → Wrong Questions

### External Process Questions

- How are you doing in your classes?
- Why didn't you start/complete....?
- What happened?
- Why didn't you just....?
- Why don't you...?
- What will you do next time?

### Internal Process Questions

- What is due right now?
- Where am I going now?
- Why didn't I just....?
- How was I supposed to know?
- Why can't I get things done?
- Why can't I be like...?
- What's wrong with me?

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## Support Metacognition

Right Questions → Right Questions

### External Process Questions

- What will you do if ....?
- What materials do you need?
- When will you start....?
- What might prevent you from....?
- Who could help you with that?
- Has this worked for you before?
- What will your completed task look like?
- How will you feel if your task is/isn't completed?
- How will I know you have completed the task?

### Internal Process Questions

- What classes do I have this week?
- What is my most important activity next week/tomorrow?
- What is due first?
- What information do I need?
- How long will it take me to....?
- When will I start?
- What things could prevent me from starting/finishing?
- What will I be able to do when the task is done?

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## 6. Provide / Request Frequent Feedback

- Every interaction
- In writing, in digital format - on the class blog/discussion board, on all tasks.
- No delay between response and outcomes (Give immediate task feedback)
- On Intranet portal systems
- To supervisors, coaches
- Use Microsoft Reviewing Toolpane
- In email
- Attach marked up assessment rubrics/evaluations to tasks
- Incorporate peer review
- Incorporate individual's feedback into feedback process
- Be elaborative and provide goal oriented language/action items with suggestions
- Give examples

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Find "Goodness of Fit"

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**Fostering successful attributes and behaviors**

- Longitudinal study to identify success factors for people with LD
  - Participants were identified as successful/unsuccessful across eight domains
    - Employment
    - Crime/substance abuse
    - Education
    - Independence
    - Family relations
    - Life satisfaction
    - Social relationships
    - Psychological health
- Six common attributes of "successful behaviors" for people with LD emerged
  - Self awareness/self acceptance
  - Proactivity
  - Perseverance
  - Emotional stability
  - Appropriate goal setting
  - Use of effective social support systems

Goldberg, R.J., Higgins, E.L., Raskind, M.H., & Herman, K.L. (2003). Predictors of success in individuals with learning disabilities: A qualitative analysis of a 20-year longitudinal study. *Learning Disabilities Research & Practice, 18*(4), 222-236.

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**Attribute: Self awareness/self acceptance**

- Individuals need to learn to accept and understand their difficulties
  - Acknowledge challenges in academic, executive functioning, and nonacademic settings
  - Reframe difficulties as one of many characteristics that comprise one's self-concept
  - Compartmentalize difficulties and not be defined by it

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### Attribute: Proactivity

- Individuals need to adopt a stance as active participants in their world
  - Seek out opportunities for leadership
  - Serve as mentors and leaders to others who struggle
  - Ask for feedback on decision-making processes
  - Take an active role and avoid passive, reactive, or rigid strategies where things are construed as “happening to them”

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### Attribute: Perseverance

- Individuals need to understand the value of persistence in light of adverse conditions
  - However, they should also be able to metacognitively evaluate when it is “time to quit”
  - Need to understand how to learn from one’s experiences and try new approaches
  - Encourage the adoption of a “spray” approach to explore multiple possibilities at once
  - Avoid perseverating and sticking with ineffective strategies that will eventually lead to backing away from challenges

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### Attribute: Emotional stability

- Individuals need to expect stressful and frustrating experiences
  - Develop methods to anticipate these experiences and identify emotional triggers
  - Incorporate coping mechanisms to help manage through stressful events
  - Maintain metacognitive awareness of situations and circumstances as they unfold to avoid being blindsided and overwhelmed by emotional responses

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**Attribute: Appropriate goal setting**

- Individuals need to set and pursue specific goals across multiple areas of their lives
  - Goals need to be articulated clearly so that one can develop a clear path to achievement
  - Goals must also be flexible and realistic to allow student to deal with changes or setbacks
  - Learn to evaluate progress to take advantage of unforeseen opportunities
  - Unrealistic and vague goals prevent individual from focusing on the specific tasks necessary to accomplish them

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**Attribute: Effective social support systems**

- Individuals need to develop reliable social networks to support their progress
  - Engaged in “niche-picking” in social and career engagements to ensure that peers and mentors will provide the kind of feedback and support needed
  - Look for individuals who provide realistic and supportive feedback (“sounding boards for reality testing”)
  - Adopt a perspective that facilitates a transition from being mentored and cared for, to serving as a mentor who cares for those in need
  - Avoid prolonged practice of dependent behaviors which can lead to learned helplessness

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**Review: Executive Function Supports & Strategies**

- Do not engage in “shame/blame”
- Action-based tasks
- Alternative tasks / choice
- Frequent check-ins
- Clear expectations
- Make it visual & hands-on, with less auditory
- Reflection journals (tracking emotions, behavior, problem-solving strategy/outcomes/successes)
- Provide mentors
- Counseling and/or Coaching
- Model, teach, & practice problem-solving
- Routines with novelty
- Write things down (post everywhere)
- Time on Task
- Frequent and Constructive Feedback
- Performance tracking
- 1. Identify:
  - errors
  - successes
  - strategies
  - tasks/steps
- 2. Predict & Plan
- 3. Monitor & Evaluate
- 4. Adjust & Set goals

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### Summary: Effective Practices

- Offer Support
  - scaffolding, check-ins: remain objective = don't judge
- Provide Structure
  - establish and maintain routines, patterns
- Incorporate Novelty
  - something new, change of pace
- Identify Expectations
  - what is flexible, what is absolute (non-negotiable)
- Give Feedback
  - **frequent**, constructive and elaborative
- Physical Activity
  - intense, physical activity 3 or more times per week

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