

Executive Functioning
Association of Educational Therapists
Chicago Regional Conference
March 10, 2006

Ari Goldstein, Ph.D.
Cognitive Solutions Learning Center, Inc.
www.helpford.com

Definitions of Executive Functioning (EF)

- Central processes involved in giving organization and order to our actions and behavior
- "Maestro" who conducts the orchestra

Definitions of EF
Agreed Upon Constructs

- Planning and decision making
 - Strategies
 - Best approaches
- Error correction and troubleshooting
 - Monitoring mistakes
 - Determining a better course
- Inhibiting responses
 - Social/Emotional
 - Cognitive

Definitions of EF
Agreed Upon Constructs

- Initiating tasks
 - Taking the plunge
 - Determining first steps
- Switching flexibly between tasks
 - Cognitive shifting
 - Physical transitions

Definitions of EF
Agreed Upon Constructs

- Internalization of language and thought
 - Start by talking through problems
 - Process becomes internalized
- Working Memory
 - Taking in information, manipulating it, and putting it back out

Definitions of EF
Meta-Cognition

- Self-awareness
- Self-knowledge
- Conscious reflection
- Self-regulatory skills
- Adaptive functioning (skill transfer)
- “Thinking about thinking”

Definitions of EF
Meta-Cognition

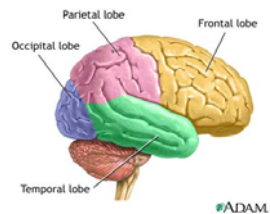
- Vitrally important in learning to read and write
- Metacognitive experiences that stimulate a child to do careful, conscious thinking can lead to the development of metacognitive knowledge

Definitions of EF
Meta-Cognition

- Two levels of meta-cognition:
 - Acquisition of metacognitive knowledge
 - The ability to produce and use this knowledge across domains
- Most susceptible to development between the ages of 9 and 12

EF and Brain Functions

- The prefrontal cortex forms a thin outer layer over the frontal lobe of the brain



EF and Brain Functions

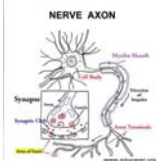
- One of the last regions of the brain to evolve as humankind evolved
- One of the last regions to reach maturity during individual human development

EF and Brain Functions

- Develops rapidly in early childhood with important changes occurring at particular ages:
 - The end of the first year of life
 - Between 3 and 6 years
 - Around puberty
 - Continues to develop into adulthood

EF and Brain Functions

- Myelin is a fatty substance which insulates the axons and facilitates the conduction of electrical impulses in the brain
- Myelination of this region continues into the 20s or possibly 30s



EF and Other Learning Problems
ADD/ADHD

- Most children with ADD/ADHD have impaired executive functioning systems
 - Response inhibition
 - Impaired planning
 - Emotional regulation
 - Impaired working memory
 - Response perseveration

EF Role In Other Disorders
ADD/ADHD

- Not all children with impaired executive functioning qualify for ADD/ADHD
- Difference can only be determined through comprehensive evaluation
 - Often leads to misdiagnosis as ADD/ADHD
- Some suggest medication should be used for all executive functioning difficulties
 - Research has shown minimal gains only in response inhibition

EF Role In Other Disorders
LD

- Many children with learning disabilities exhibit some form of difficulty with their executive functioning system
- Pervasive in reading and writing difficulties
- Required for mathematics reasoning and complex problem solving
- Organizational difficulties

EF Role In Other Disorders
Conduct Disorders

- Hostile cognitive biases
- Failure to anticipate consequences
- Failure to inhibit, despite intentions
- Failure to detect punishment information or learn from punishment

EF Clinical Assessment
Instruments

- Dellis-Kaplan
 - Comprehensive 9 subtest system
- BRIEF
 - Rating scale for parents and teachers
- Wisconsin Card Sorting Test
 - Determining rules for categories and sorting
 - Measures perseverative thinking
- Tower of London
 - Pegboard activity
 - Measures impulsivity and problem solving ability

EF Clinical Assessment
Instruments

- Comprehensive Trail Making Test
 - Visual search and sequence
- WISC/WAIS
 - Block Design
 - Picture Arrangement
- Woodcock Johnson Tests of Cognitive Abilities
 - Concept Formation
 - Planning

EF Clinical Implications

- Over diagnosis of attentional disorders
- Middle School – High School
 - Increased demands
 - More higher order thinking required
 - Transitions from teacher to teacher
 - Described as “lazy” or “unmotivated”

Academic Implications *Writing*

- First steps
- Brainstorming
- Organization of text
- Tying in materials from various sources
- Editing

Academic Interventions *Writing Research*

- Treat writing as a thinking device rather than a transmitter of writer’s knowledge
- Must extend beyond traditional:
 - Procedural knowledge: How to make writing easier to read
 - Content knowledge: How to make it more interesting
- Negotiate and construct a shared understanding of what writing is for and how we engage in it

Academic Interventions

Writing

- Teach kids to “POP”
- Graphic organizers
 - Four Square
 - Kidspiration
 - Inspiration

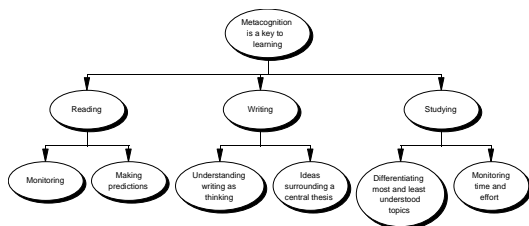
Academic Interventions

Writing – Four Square

Reading <ul style="list-style-type: none"> ▪Monitoring ▪Making predictions 	Writing <ul style="list-style-type: none"> ▪Writing as thinking ▪Ideas surround a central thesis
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Metacognition is key to learning</div>	
Studying <ul style="list-style-type: none"> ▪ Monitoring time and effort ▪Most and least understood information 	Metacognition plays a vital role in reading, writing, and studying

Academic Interventions

Writing - Inspiration



Academic Interventions

Writing - Inspiration

Metacognition is key to learning

I. Reading

- A. Monitoring
- B. Making predictions

II. Writing

- A. Understanding writing as thinking
- B. Ideas surrounding a central thesis

III. Studying

- A. Differentiating most and least understood topics
- B. Monitoring time and effort

Academic Implications

Reading

- Tying new information to old
- Comprehension of abstract texts
- Monitoring understanding of text
- Metacognitive and meta-linguistic awareness are part of the foundation of learning to be literate

Academic Interventions

Reading Research

- Successful comprehension depends upon directed cognitive effort
- The successful reader intentionally applies strategies
- The metacognitive reader plans the reading task, monitors whether a coherent representation of the text is being maintained, and adopts different processing strategies relating to the goals and outcome of ongoing reading

Academic Interventions
Reading-Early Readers

- Tie into prior knowledge
- Practice prediction
- Increase self monitoring
 - Short summaries
 - Questions midway through
 - Did I understand? If not, why not?

Academic Interventions
Reading

PQ3R

- Preview
 - Read all sub-headings and graphs/pictures
- Question
 - Generate a list of questions about subheadings
- Read

Academic Interventions
Reading

PQ3R

- Reflect
 - Is there anything you learned that you didn't ask?
 - Text to world, text to text, text to self
- Review
 - Did you answer all of your questions?

Academic Implications

Studying Research

- Difficulty with planning and breaking down long term assignments
- Accurate meta-cognitive monitoring is essential to effective regulation of study
 - Differentiate well learned material from less well learned
 - Students with EF problems are not very accurate when asked to predict performance on a test
 - They do not select the least understood text for re-study

EF and Mediation

How Do We Develop EF?

- Two forms of interaction between learner and educator
 - Direct learning
 - Direct transfer of information from teacher to student
 - Change physical environment

EF and Mediation

- Two forms of interaction between learner and educator
 - Mediated learning
 - Teacher acts as facilitator
 - Helps interpret and generalize skills involved
 - Scaffolding
 - Directly address underlying neurological impairment

EF and Mediation
3 Aspects
Intentionality/Reciprocity

- Focus on the learner's needs and shape the task according to these needs
- Understand where student is coming from

EF and Mediation
3 Aspects
Transcendence

- Go beyond the here and now (Bridging)
- Generalized strategies rather than narrow skills

EF and Mediation
3 Aspects
Mediation of Meaning

- Convey the reason for the learning activity
- Significance of task
- Interpret learners accomplishments

EF Interventions

- Teach language of thinking
- Help students develop vocabulary about thinking
 - Terms like hypothesis, reason, evidence, possibility, strategy, and perspective
- Show students how to generalize this language to all academic and social domains

EF Interventions

- Start by “thinking aloud”
- Generate alternatives
 - Different viewpoints on a topic
 - Several approaches to solving a problem
- Ask "What's going on here?" and "What do you see that makes you say so?"

EF Interventions

- Powerful Questions
 - Teacher provokes students to address in turn three kinds of questions about an important topic: questions of exploration, connection making, and conclusion
 - Encourages students to formulate and then pursue questions. Teacher facilitates the process without either providing the questions or answering them

EF Interventions

- Tools For Mediation
- Feuerstein’s Instrumental Enrichment
- Various puzzles (i.e. Quizzles and Sudoku) with appropriate mediation
- Any learning task which allows for generalization of a skill

EF Interventions
Academic

- Time management skills
 - Time management notebook
 - Self Monitoring
- Materials management
 - Color Coding
 - Binder systems
- Cognitive organization will lead to physical organization!

EF Interventions
Academic

- Shifting/Transitioning
 - Practice shifting physical tasks
 - Practice shifting cognitive tasks and focus
- Visual organizers for other purposes

References

- Baker, L. & Brown, A.L. (1994) Metacognitive Skills and Reading. In P.D. Pearson, R. Barr, M.L. Kamil & P. Mosenthal (Eds.) Handbook of Reading Research Vol. 1 (pp 353-394) New York: Longman
- Barkley, Russell A. (2000) Genetics of childhood disorders: XVII. ADHD, Part 1: The executive functions and ADHD. Journal of the American Academy of Child & Adolescent Psychiatry. Vol 39(8), 1064-1068
- Ben-Hur, M. (Ed.) (1994). On Feuerstein's Instrumental Enrichment: A Collection. Palatine, IL: IRI/Skylight.
- Biederman, Joseph; Monuteaux, Michael C; Doyle, Alysa E; Seidman, Larry J; Wilens, Timothy E; Ferrero, Frances; Morgan, Christie L; Faraone, Stephen V. (2004) Impact of Executive Function Deficits and Attention-Deficit/Hyperactivity Disorder (ADHD) on Academic Outcomes in Children. Journal of Consulting and Clinical Psychology. Vol 72(5), 757-766.
- Flavell, J.H. (1979). Metacognition and Cognitive Monitoring. American Psychologist, 34, 906-911
- Fischer, Mariellen; Barkley, Russell A; Smallish, Lori; Fletcher, Kenneth. (2005) Executive Functioning in Hyperactive Children as Young Adults: Attention, Inhibition, Response Perseveration, and the Impact of Comorbidity. Developmental Neuropsychology. Vol 27(1), 107-133
- Howie, D.R. (2003). Thinking about the Teaching of Thinking. Wellington: New Zealand Council of Educational Research
- Ownsworth, Tamara; Fleming, Jennifer. (2005) The Relative Importance of Metacognitive Skills, Emotional Status, and Executive Function in Psychosocial Injury. Journal of Head Trauma Rehabilitation. Vol 20(4), 315-332.
- Packer, Leslie. 2005 www.tourettesyndrome.net/ef.htm

References

- Ruttle, Kate. (2004) What goes on inside my head when I'm writing? A case study of 8-9-year-old boys. Literacy. Vol 38(2), 71-77.
- Sperling, Rayne A; Walls, Richard T; Hill, Lee Ann. (2000) Early relationships among self-regulatory constructs: Theory of mind and preschool children's problem solving. Child Study Journal. Vol 30(4), 233-252.
- Thiede, Keith W; Anderson, Mary C. M; Theriault, David. (2003) Accuracy of metacognitive monitoring affects learning of texts. Journal of Educational Psychology. Vol 95(1), 66-73
- Tishman, S. (2002). "Artful reasoning." In Grotzer, T., Howick, L., Tishman, S. & Wise, D., Art works for schools: A curriculum for teaching thinking in and through the arts. Lincoln, MA: DeCordova Museum and Sculpture Park.
- Tishman, S., & Perkins, D. N. (1997). "The language of thinking." Phi Delta Kappan, 78(5), 368-374.
- Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, Massachusetts: Harvard University Press.
- Weaver, Charles A. (1990) Constraining factors in calibration of comprehension. Journal of Experimental Psychology: Learning, Memory, and Cognition. Vol 16(2), 214-222.
- Winne, Philip H; Perry, Nancy E. Measuring self-regulated learning. [References]. [Book; Edited Book] Bookaerts, Monique (Ed); Pintrich, Paul R (Ed); Zeidner, Moshe (Ed). (2000). Handbook of self-regulation. (pp. 531-566). xxix, 783 pp. San Diego, CA, US: Academic Press.
- Zelazo PD. Executive function in typical and atypical development. In: Goswami U, editor. Handbook of Childhood Cognitive Development. Oxford: Blackwell; 2002. p. 445-469.