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Whose Children Will Get the Best Jobs in the 21st Century?

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With available information in all fields doubling every five years and the access to that information available globally, the best jobs will not go to the person who knows the most facts. Computers will always have the edge on that and when your children enter the workforce in the 21st century, if a computer can do the job, it will.

The best jobs will go to applicants who have the skillsets to analyze information as it becomes available, the flexibility to adapt when what were believed to be facts are revised, and to collaborate with other experts on a global playing field requiring tolerance, willingness to consider alternative perspectives, and articulately communicate one's ideas successfully.

The factory model of education still in place was designed for producing assembly line workers to do assigned tasks correctly. These workers did not need to analyze, create, or question. Automation and computerization are exceeding human ability for doing repetitive tasks and calculations, but the educational model has not changed. In response to more information, students are given bigger books and more to memorize. To provide more time for this additional rote memorization, creative opportunities- the arts, debate, and general P.E. are sacrificed to the alter of more predigested facts to be passively memorized without opportunities for students to discover the connections between isolated facts and build networks of concepts nor opportunities to apply what they learn in other contexts.

This assembly line, test prep system doesn't prepare today's children to what the best job employers are already seeking—the ability to transfer knowledge to new contexts and apply that knowledge along with critical analysis of new information, judgment, creative problem solving, and the ability to evaluate and select which new data and tools can be applied in new ways to solve new problems and create new outcomes.

Without these higher order, cognitive skillsets, today's students will only be prepared for assembly line work, slightly more technological, or service industries. They won't be able to compete on the global employment market with students currently developing the executive functions to succeed at the best, most creative, and personally rewarding jobs. This is not to say that the other types of jobs are not important or that the people who do them are less deserving of respect and appreciation. What is important is that today's students have the education they need to choose the career path that will give them the most satisfaction.

What Are the Skillsets and How Do Your Children Get Them?

What my field of neurology has called "Executive Functions" for over 100 years are these highest cognitive processes. These are skillsets beyond those computers can do because they require flexible, interpretive, creative, and multidimensional thinking—suitable for current and future challenges and opportunities. The executive functions include judgment, prioritizing, planning ahead, interpretation, critical analysis, deduction, induction, pattern recognition and expansion, self-monitoring, self-correcting, abstraction, concept development, flexibility, tolerance, risk assessment, resisting immediate gratification to plan and achieve long-term goals, and creative problem solving.

The control center that directs the brain's executive function is in the prefrontal cortex. Cognitive processing of information that takes place in areas in the prefrontal cortex is also what allows humans to exercise conscious control over our emotions and thoughts. These executive functions are exactly what employers for the top jobs of our children's future will be seeking, because these are what computers can't do.

Where The Human Brain Has the Greatest Advantage

The prime real estate of the prefrontal cortex comprises the highest percentage of brain volume in humans, compared to all other animals, which is roughly 20% of our brains. The executive function control centers in the PFC give us the potential to consider and voluntarily control our thinking, emotional responses, and behavior. It is the reflective "higher brain" compared to the reactive "lower brain".

Animals, compared to humans, are more dependent on their reactive brains to survive in their unpredictable environments that require automatic responses not delayed by complex analysis. As man developed more control of his environment, the luxury of a bigger reflective brain evolved to its current proportions.

The prefrontal cortex is the last part of the brain to mature (the neuroplasticity process of pruning of unused cells to better provide for the metabolic needs of neurons and strengthen the connections in the circuits that are most used). This pruning and strengthening that is highly defining of the type of adults we become continues into the twenties, with the most

rapid changes in the age range of 8-16. Until the executive function stimulation comes from schoolwork, parents can intervene and promote the activation and strengthening of these developing brain circuits during these years of most rapid change. The stimulation of these networks during the ages of their rapid development can strongly influence the social-emotional control and the highest thinking skillsets that will determine today's children's opportunities in the global job market they'll enter.

Preparing Your Children for the Challenges and Opportunities of the 21st Century

Help your child develop personal responsibility: Because executive functions, such as organization, prioritizing, resisting immediate gratification, and goal planning are not being developed in the over-stuffed curriculum of predigeted facts that are the focus of current instruction, many students enter college inadequately prepared to succeed in or get the most from those years. We are seeing an increased drop out rate among college students and more students who require five or more years to obtain their college degrees.

During the primary and secondary school years, students often rely on their teachers and parents to keep them on track. Through high school, most teachers take attendance, call on students, hold students accountable for homework, and give assessments with enough frequency for students and parents to know how they are doing. In large college classes students can be anonymous. Once in college, tthere is no more hand-holding, parent-teacher conferences, often no attendance taken, and frequently only a midterm and final exam to show students what they didn't know - usually when it is too late.

With the still immature prefrontal cortex, many college students, who have not had opportunities to develop their executive function circuits, lack the judgment and long-term goal development neural networks to resist the immediate gratification of hiding behind their laptops, surfing the web or checking Facebook instead of staying focused, taking notes, participating in discussions, or asking questions in class...if they go to class at all.

If children aren't prepared early to resist the immediate gratifications that abound during their college years, they miss out on what may be the first opportunity they have to really develop higher-level thinking. If their precollege years in school were overloaded with rote memorization, college could be the opportunity to develop the higher thinking skills—if there is some groundwork laid. The temptations are high and the PFC still immature—a setup for kids to miss out on the knowledge and skillsets that will be sought after for the best jobs.

Your intervention during your children's early development can build the responsibility, goal-planning, and self-directed motivation needed to get the most from their higher education. The children who have opportunities to use and strengthen their developing executive functions early will have greatest likelihood to get the most from lectures, reading, and developing relationships with their teachers. These are the students who will recognize the value of learning opportunities, make the effort to sustain mental focus and participate in discussions in class, and plan ahead for long-term assignments and tests.

Build a Better Brain Now to Get What is Needed for the Best Jobs Later

Here's the challenge for parents. We know that left to its own rate of maturation, the brain's circuits of judgment, prioritizing, and resisting immediate gratification, don't set up until the mid to late 20s, when it is too late to take advantage of the opportunities missed while texting their way through classes. Yet, you can't just tell your children that good work habits, best effort on homework, class participation, building relationships with teachers and professors are critical to future success. Even if you do, the words don't mentally "compute" since their brains are designed to seek pleasure, risks, and peer approval.

Those latter behaviors were important in our animal ancestors who needed to be the standouts in the herd to get a mate, gain status, be assured of their access to the best food, and even herd leadership. But, risk taking and pleasure seeking no longer are the criteria that will standout from the herd of job applicants after graduation.

Some suggestions to work on early

• Children, throughout their educational journey, should be taught how to succeed in school: This includes being explicitly taught how to focus attention, study, organize, prioritize, review and actively participate in class. They should also be provided with motivating, relevant experiences that make evident the reasons for learning the facts or procedures they are given to memorize.
• Making the switch from memorization to mental manipulation: Memorization that was adequate in high school is not the way students are graded in college. In college, and in many jobs, it is more about applying, communicating, and supporting what one knows. Students are asked to demonstrate executive function skills and conceptual knowledge by comparing and contrasting concepts, giving new examples of concepts, and transferring knowledge by applying big ideas to solve new types of problems. When parents provide children with opportunities to apply what they learn in school, they recognize the value of the facts and procedures the are required to memorize so that information becomes activated and incorporated into a larger memory bank instead of pruned away from disuse...and rememorized next year.

Intervention Now

As your children will become the citizens, employers, employees, professionals, educators, and caretakers of our planet in 21st century what can you do to help prepare them? What can you promote in their schools to be sure they are equipped with the skillsets they'll need to take on challenges and opportunities we can't yet even imagine?

Judgment builds through predicting, planning, revising, and accountability:
Encouraging your children to prioritize and plan can begin by make a game out of having them estimate things such as the amount of time it might take to drive to a location after looking at a map, or how much time they predict it will take to shop for their soccer uniform.

The powerful lessons that follow predictions and estimations take place because the brain is programmed to find out if its predictions are correct. This means that when the actual time is compared to the time a child estimates, her brain will be attentive. This gives you a teachable

moment to encourage your child to consider why her estimation was longer or shorter than the final result.

These activities foster the development of accurate prediction and time-use planning that become critical for children's later success with long-term school projects and reports. Helping your child develop the judgment and prediction skills, about time needed for long-term school assignments, avoids the stress, and often, lower quality work, that comes from waiting until the last minute.

The development of the executive function of judgment can grow to include opportunities you give your children for self-checking. You can start with responsibilities that have real, but not critical outcomes, such as having your child pack her own bag for a sleepover, after you've done it together "thinking out loud" as you predicted what she'd need. She'll enjoy the pride of your trust in ultimately letting her pack her own bag. If she forgets her teddy bear or beach towel, she'll experience the consequences of her planning haste and she will be the one motivated to focus on the details with more attention to avoid similar mistakes the next time. You can be supportive, even sympathetic, but not a rescuer. Having her experience the consequences of her inadequate planning shifts responsibility and promotes the construction of those neural networks for judgment and organization in your child's developing brain. These experiences will serve her well in the years to come.

Prioritizing: In school and later on the job, this executive function is what takes place when the brain can distinguish low relevance details from the main ideas, evaluate the order in which to take on tasks and predict which parts of a larger task should get the most time and planning attention. Building this cognitive skill early yields children who grow to make the most efficient use of their time and are equipped to juggle sports, clubs, friends, and homework with foresight.

Start by encouraging younger children to consider which items on a shopping list should be purchased first or last. A lesson about using critical thinking when prioritizing is learned by if you let your child plan the order of errands. If he decides grocery shopping should be done before going to the dry cleaners and stationary store, a lesson in prioritizing takes place when he discovers the ice cream is melted as he unpacks the groceries at home.

These teachable moments apply later when he needs to prioritize his activities and analyze choices before acting—something that can save his life because you provided the opportunities for him to build executive functions that help his reflective brain resist his adolescent, lower brain inclination to choose immediate gratification and succumb to peer pressures without considering consequences or planning for long-term goals.

Setting goals and making considered choices for goal achievement: Unless children develop this executive function, they are limited in their capacity develop realistic and manageable goals. While still under parental watch, children need opportunities to set goals for things they want and to make decisions and deal with choices and uncertainty, rather than be given the answers or told what is right. Starting when children are young and receptive to taking on challenges, but still knowing you have their backs, you can promote the development of their future goal development skills.

Once your child sets a goal within the realm of possibility for his age and skills, if you have provided experiences for him to build up this type of thinking, it can be a powerful brain circuit builder for him to follow through with the plans he makes (or ignore them). He then needs to experience the authentic consequences of his choices, a lower grade or not getting selected

for the team, because he chose the immediate gratification of video game playing instead of planning, practicing, or preparing for his larger goal.

This is one of the greatest challenges of parenting as it is far from easy for you to foresee the consequences of choices your children make knowing they could be closing some doors for their future—such as not taking the challenging courses that the most selective colleges expect to see in applications of suitable candidates for admission. Yet, this is when parents looking at the bigger life picture, find the fortitude to withhold pressure and criticism, These are times to resist trying to "fix it" or critique the mistakes made, but rather to encourage your child that there will be larger and more desirable goals coming soon and encouraging him to evaluate what he did right and consider what he could do differently next time.

You may now recognize that some of the judgment, prioritizing, and resisting of immediate gratification strength you now have developed because your parents or a particular teacher gave you opportunities to make your own choices, and experience the consequences, as they gave you the opportunities to build your executive functions.

C**ommunication and Information Analysis:** New information is being discovered and disseminated at a phenomenal rate. It is predicted that 50% of facts children are memorizing today will no longer be fully accurate or complete in the near future. Children need to know how to evaluate sources of accurate information and then to use critical analysis to assess the veracity/bias and current/potential uses of new information. These are executive functions children can build with parental guidance from a young age.

One size does not fit all, nor should all children think alike if we are to remain a democratic and progressing society. The current testing system and the curriculum that it has spawned leaves behind the majority of students who do not do their best with the linear, sequential instruction.
Promote deeper thinking and build communication skills by finding out the topics your child will study in the coming school months. Then help promote her interest in the topics by introducing things at home that will help her relateto the topic when it comes up. She will then have the background knowledge and interest that promotes her higher level thinking and participation in class discussions.

Sustain that development by continuing class discussions at home, through current and local events related to your child's interest. These discussions increase the relevance of new learning so it is incorporated into long-term memory. Even more critical, through your encouraging her to make comparisons and express and support her opinions, she is processing new learning through her executive function networks as she forms and defends her opinions, analyzes source reliability, and questions things she hears or reads using her developing critical analysis.

Collaboration: Children of today need opportunities to work in groups, if not is school then in play groups as youngsters, and later in clubs, sports teams, or volunteer organizations to be ready to collaborate and communicate with tolerance and flexibility with others on a global level.

Experiences of Tolerance: In a global world of collaboration communication and openness to unfamiliar cultures and ideas will be a critical skill sought in job applicants in the future. Children benefit from family discussions and experiences that appreciate other cultures. You can start with discussing contributions made throughout the ages to things tyour children enjoy now, such as where and when the sports or foods they like originated.

Older children grow to model your own responses to cultural and language differences. For example, if you try to use even your limited knowledge of their language when speaking with a non-English speaking individual, you are modeling the value of these communication skills for your children.

Turn Learning into Knowledge: T**ransfer is Using Learning Beyond the Classroom.** New "learning" does not become permanent memory unless there is repeated stimulation of the new memory circuits in the brain pathways. This is the "practice makes permanent" aspect of neuroplasticity where neural networks most stimulated develop more dendrites, synapses, and thicker myelin for more efficient information transmission. These stronger networks are less susceptible to pruning and become long-term memory holders.

Children need to use what they learn repeatedly and transfer classroom learning by using it in ways different than the rote drills in which it was practiced. Promoting use of the executive functions stimulates neural networks to communicate and form connections that become concept networks of related information. You know your child's interests and can help him build those networks and stable long-term memories his brain can retain by providing opportunities for him to apply learning in meaningful ways. These "transfers" that relate school learning to real life situations and will protect the isolated rote memories from being pruned because they become incorporated into useful, retrievable, and long-term memory.

Your Voice

You've probably seen the bumper sticker, "If you can read this, thank a teacher." Since you are reading this article, you can clearly do more than basic reading. It is likely you recall at least one teacher who influenced how you learned to think and become the person you are today.

During the past twelve year, after leaving my neurology practice to become a teacher, I first taught elementary, then secondary, and for the past two years have been teaching other educators about how they too can apply neuroscience research to strategies that provide successful, joyful learning experiences for students even with the impossible curriculum demands. During these past several years I've spent time with some of the most extraordinary people I've ever met. These are our children's teachers and they deserve our appreciation and help regaining the opportunity to give their best to all children.

This means making your voice heard locally or to the state and national departments of education regarding more appropriate curriculum for students and professional development opportunities for teachers. Linda Darling-Hammond wrote that in our current educational system accountability is unidirectional and, "Although the child and the school are accountable to the state for test performance, the state is not accountable to the child or school for providing adequate educational resources."

Until the changes are made, you remain the caretaker of your child's development of his or her greatest resources—that of the cognitive development of strong executive functions. As the caretaker of your child's brain, during the years of rapid brain development, it falls to parents to consider the ehighest brain attributes most important to build, and provide the opportunities your children need to achieve their highest potentials as the inherit the challenges and opportunities of their 21st century.

More information on this topic and other suggestions for promoting academic as well as social and emotional success in your children, check out my other

psychologytodayonline.com at Radical Teaching, Strategies from a neurologist and teacher, my **Edutopia** videos and staff blogs at http://www.edutopia.org/big-thinker, or my book, ***How Your Child Learns Best*** (Sourcebooks 2008). Watch for my upcoming book, **Brain Operating Manual for Parents: I*nsights from a Neurologist/Classroom Teacher for Helping Your Children Build Better Brains.***

Darling-Hammond, L. 2010. The Flat World and Education: How America's Commitment to Equity Will Determine Our Future. Teachers College Press, New York, p 301.

"Ask Dr. Judy" - About Your Neuro-Education Topics

If there are topics about which would like to read more that relate to the neuroscience of learning and the brain - from my perspective as a neurologist, former classroom teacher, and current author and presenter about how the brain learns, please include your questions as blog responses with the heading of "Ask Dr Judy" questions. Although I will not be able to address specific individual questions regarding learning problems for individual children, I will try to take on the topics of highest concern and interest about mind, brain, and education.

My area of specialty is using the neuroscience research I read and my years of classroom experience and parenting to make suggestions that connect the research with ways to optimize education and parenting for all children to achieve the highest joyful potentials. I do not focus on individual conditions, such as autism ADHD, or dyslexia, as these deserve responses from subspecialists. As this is a blog format, others may join in the conversation with their opinions and research that relates to the questions.

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