WAYS TO ACHIEVE THE GOALS OF EDUCATION: INSIGHTS FROM NEUROSCIENCE, PSYCHOLOGY, AND TEACHING

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In this paper, I consider how to further the goals of education, draw out explicit implications of that for teaching, and end with the relevance of this for educating gifted children. I will emphasize the fundamental importance of learning by doing, that teachers' humanity is far more important than their knowledge or skills, that what gets rewarded is what will get emphasized, and the critical role of attitudes. I will discuss why it is so critical to address the whole child and the tremendous value of the arts in doing that. To understand how to further the goals of education, we must identify what those goals are. Therefore I start there.

THE GOALS OF EDUCATION

What is, or should be, the goal education?

Intellectual skills, habits and skills of the mind, such as being able to think clearly, critically, and creatively, are part of the goal of education. Under this heading I would put skills such as

- being able to concentrate and focus, and being able to sustain that
- being able to creatively problem-solve and 'think outside the box'
- being able to reason logically and clearly
- being able to think critically and to show good judgment so that one can detect flaws or inconsistencies in an argument or line of reasoning
- to be always trying to deepen and enrich one's understanding
- being able to admit when one is wrong and to learn from one's mistakes

- being able to recognize when change is needed and to have the flexibility to change courses if needed
- to try to be open to what is, instead of pre-judging, and to question rather than to blindly accept what one is told

What we want *most* for our children is that they should be good human beings. As educators we *must* be concerned with this rather than simply being concerned with intellectual prowess alone. For, as Martin Luther King pointed out, an education that only teaches intellectual skills "may prove the greatest menace to society. The most dangerous criminal may be the man gifted with reason, but with no morals" (1947: 10).

Thus I propose that another part of the goal of education must be to educate the heart. Under this heading I would put cultivating qualities or attributes such as:

- caring, compassion, and kindness
- to feel a commitment and responsibility to help others, a sense of social or communal responsibility, rather than being focused on narrow self-interest
- to have a generous spirit
- to readily forgive and not hold a grudge
- to always be inclined to give someone the benefit of the doubt
- to be able to laugh at oneself and not take oneself too seriously
- humility and modesty
- to be courteous and respectful
- to have the strength of character to do what is right even if it is unpopular, inconvenient, no one is looking, or you might pay a high price for it
- to respect others and be accepting of differences
- to be honest and truthful
- to have a sense of fairness and justice

People from southern parts of Africa might call the sum of these qualities 'ubuntu' and a Jew might call someone with these qualities a 'mensch.' *Ubuntu* means being a human being, the essence of being a human being, having humanity. Zimbabwe's Stanlake Samkange (1980) explains it thusly: "To be human [to have *ubuntu*] is to affirm one's humanity by recognizing the humanity of others and, on that basis, establish respectful human relations with them."

There is a third part to the goal of education, I propose, which includes those *qualities that do not fit easily under 'the head' or 'the heart.'* These include:

- to have self-confidence, a can-do attitude, and self-respect
- to have discipline, perseverance, and motivation so that one stays the course and finishes one's task; even when the going gets rough; even in the face of setbacks and discouragement, one does not give up
- to have resilience and endurance in the face of adversity
- to have the self-control and self-discipline to not give in to temptations, the heat of the moment, or unconsidered remarks
- to retain a sense of wonder and awe, an appreciation of the magic of life
- to retain one's native curiosity and excitement about learning
- to have a sense of humor
- to have optimism
- to be open to possibility

A Prayer for Twenty-First Century Children

Marian Wright Edelman

…Help us to not raise a new generation of children

With high intellectual quotients and low caring and compassion quotients

With highly developed computer skills but poorly developed consciences

With mounds of disconnected and unsynthesized information without a moral context to determine its worth

With more and more knowledge and less and less imagination and appreciation for the magic of life that cannot be quantified or computerized

With more and more worldliness and less and less wonder and awe for the sacred and everyday miracles of life.

…Help us to raise children who care.

Excerpted from *The Sea Is So Wide and My Boat Is So Small* by Marian Wright Edelman (Hyperion, 2008)

THE MEANS BY WHICH TO ACHIEVE THOSE GOALS

How are schools to achieve these goals?

The Importance of Action for Learning

The foremost means to educate is through doing, through hands-on, problem-based learning. There are many reasons why action is so critical to learning. I will mention a few.

1. We evolved to learn to further some purpose we set for ourselves, to help us do what we want to do. We pay attention to information, and learn it when we need it. We need it when it is important for what we want to do. If information is not relevant for action, we do not pay attention in the same way. We learn something when we need it for something we want to do (Olson, 1964). My son shows me how to program the VCR and I think I understand. When I go to program the VCR, I realize I have not really understood at all. The same applies when we teach children in school. In the course of whatever it is they are doing—writing a paper, building a tower, drawing a map, or building an integrated circuit—they will need certain information. They will want to learn it then and they will understand it quicker and in far greater depth than if it is just taught didactically in the abstract. Listen as a high school teacher of the type of salsa dance known as *Rueda* explains:

> In *Rueda* instruction there is no need to call attention to individual errors. For example, on Day 1 when students are learning '*guapea*' footwork, they are encouraged to shift their weight. However, the group's progress is not delayed to make sure all students are doing the weight shift properly. Students with problems shifting their weight (and therefore often rhythm problems) discover, when dancing in the circle with others, that weight shift and rhythm are necessary for them to keep their place and to be where they are supposed to be. Technique is understood intuitively by the body; it is necessary for functionality. (Sam Gill, 2009)

If I asked you who would learn and remember a route better—the driver or the passenger in the car, you would immediately know it is the driver, and you would know why, because the driver has to actively use the information while the passenger just passively sits in the car. Much psychological research has demonstrated this principle and ancient traditions have long known it (e.g., Olson, 1964). We seem to forget

this when it comes to schooling, however, for we tend to have students passively sitting and listening with only the teacher active in the front of the room.

> a Chinese proverb:
>
> I hear, and I forget.
> I see, and I remember.
> I do, and I understand.

2. "The act teaches us the meaning of the act" (Abraham Heschel). This has several meanings. One is that one can *only* really learn something through doing or experiencing it. I can try to explain to someone who has never experienced it what it is like to ride a bike or fall in love. But, you can never really understand these until you have experienced them. The Dalai Lama has said that if you want to be happy, you should practice compassion toward others. I submit that that statement is utterly incomprehensible unless you have experienced the joy that comes from giving others joy or easing their pain.

Another meaning is that to do something well, you need to give it your full, undivided attention, so even if you are doing it for less than noble motivations, the act "can purify the intention" (Heschel). For example, suppose a musician is only playing a concert for the money. During the concert she cannot play well, however, if her mind is elsewhere thinking about the money; she must be fully in the moment, fully focused on the music.

3. *If students act as if they are good; they will become good*. William James (1884) and Carl Lange (1887) independently developed theories of emotion that were later combined and became known as the James-Lange theory of emotion. "Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike… [T]his order of sequence is incorrect," wrote William James. His argument was that we do not flee from a bear because we are afraid; instead our first reaction is to flee and then we try to make sense of that (why did I do that?) and conclude it must have been because we were afraid.

Prefrontal cortex (to which I have devoted my life's work) is over-rated. It is true that to learn something new, we need prefrontal cortex. Thus, among novices, those who recruit prefrontal cortex most, usually perform best. However, when we become familiar with something and get good at it, usually we are *not* recruiting prefrontal cortex. After

something is no longer new, those who recruit prefrontal cortex *least* usually perform best. Why? Prefrontal cortex is the evolutionarily newest region of the brain. Other brain regions have existed for 100s of 1,000s of more years of evolutionary time and so have had far longer to perfect their functioning. They can subserve task performance ever so much more efficiently than can prefrontal cortex. Thus, I need prefrontal cortex to learn a new dance step, but later if I try to think about what my feet are doing while dancing, I will not dance well. Similarly, children need prefrontal cortex to learn what sound goes with what letter, but when a fifth-grader reads, we no longer want the child to be thinking about letter-sound mapping; we want that to have become automatic. A child may know intellectually (at the level of prefrontal cortex) that he should not hit another child or grab another child's toy, but in the heat of the moment if that knowledge has not become automatic (passed on from prefrontal cortex to subcortical regions) the child will do exactly what he should not do (and exactly what, if you asked him, he knows he should not do).

The only way something becomes automatic (becomes passed off from prefrontal cortex) is through action, repeated action. Nothing else will do. An adult could lecture to the child until he or she is blue in the face. William James (1899) spoke at length about this over 100 years ago:

> [We] talk of the smoking-habit and …the drinking-habit, but not of the …moderation-habit or the courage-habit. But the fact is that *our virtues are habits as much as our vices. Our nervous systems have* grown *to the way in which they have been exercised, just as a sheet of paper or a coat, once creased or folded, tends to fall forever afterward into the same identical folds.*
>
> [W]e do a thing with difficulty the first time, but soon do it more and more easily, and finally, with sufficient practice, do it semi-mechanically, or with hardly any consciousness at all….The great thing in all education is to make our nervous system our ally….[N]o matter how good one's sentiments may be, if one has not taken advantage of every concrete opportunity to act, one's character may remain entirely unaffected for the better….A tendency to act only becomes effectively ingrained in us in proportion to the uninterrupted frequency with which the actions actually occur, and the brain 'grows' to their use.
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> Don't preach too much to your pupils….Lie in wait rather for the practical opportunities, be prompt to seize those as they pass, and thus at one operation get your pupils both to think, to feel, and to

> do….Preaching and talking too soon become an ineffectual bore. (emphases added)

> We are what we repeatedly do. Excellence, then, is not an act, but a habit.
>
> We do not act rightly because we have virtue or excellence, but we rather have these because we have acted rightly; 'these virtues are formed in man by his doing the actions'; we are what we repeatedly do. (Aristotle, *Ethica Nicomachea*, 4th century BC)

Durkheim went even further when he sagely observed back in 1897 that *the power of words or the best-reasoned, logical arguments to educate, persuade, or change minds is overrated*:

> Knowledge is not sought as a means to destroy accepted opinions but because their destruction has commenced…. [Logical arguments] would be ineffective if these sentiments still possessed vitality; or rather, would not even take place. Faith is not uprooted by dialectic proof; it must already be deeply shaken by other causes to be unable to withstand the shock of argument. It is certainly not the learning he acquires that disorganizes religion; but the desire for knowledge wakens because religion becomes disorganized.

What are the practical implications of this for teachers? To understand the deep truth of "if *you* want to be happy, practice compassion," students need to practice compassion and experience for themselves the joy it brings them. If we want to produce compassionate students, we need to have our students practice compassion day in and day out, throughout every day. The way to improve compassion is to practice it. Repeated practice is the way to make compassion a 'habit,' second nature, a part of the fabric of who we are. Thus, I recommend giving students the assignment of doing three acts of kindness each and every day. They can be quite small and simple such as a smile or a kind word. Examples could be saying thank-you to the bus driver or the person handing you your lunch, holding the door for someone, helping someone carry a load, giving a compliment ('great smile' or 'I like your shirt'), offering your seat to an older person, sharing a treat with someone, comforting someone who is upset, inviting someone on the sidelines to join in a game, letting someone else go first or play with the toy you wanted, or helping to clean up.

How does this apply to cognitive skills? I have studied an early childhood program called *Tools of the Mind* that emphasizes the development of the cognitive control skills dependent on prefrontal cortex called "executive functions" (Diamond et al., 2007). Elena Bodrova and Deborah Leong (2007), who developed the educational program, initially tried it as an add-on to existing curricula. For example, from 10-11:00 am, children might do *Tools of the Mind* activities. Children improved on what they practiced in those modules, but it did not generalize. It did not generalize to other contexts or other executive function skills. For benefits to generalize to other contexts and other executive function skills, supports for, training in, and challenges to executive functions had to be part and parcel of what the children did all day long. The children's actions throughout the day had to be exercising executive functions to really see a benefit. Thus, Drs. Bodrova and Leong embedded aspects of executive function training in academic activities such as literacy and math, as well as having activities whose primary focus was to improve executive functions.

A *Tools of the Mind* literacy activity with an embedded executive-function component is *Buddy Reading*. Children of 4 or 5 years each select a book, get into pairs, and take turns 'reading' the story in their picture books. With each child eager to tell his or her story, no one wants to listen. To help them succeed at exercising inhibitory control (one of the executive functions), the teacher gives one child a drawing of lips and the other a drawing of an ear, explaining, "Ears don't talk; ears listen." With the concrete, visible reminders, the child with the ear is able to inhibit talking, wait his or her turn, and listen. Otherwise the child would not be able to do that. Children then trade drawings and roles, learning the social norms of turn-taking and waiting one's turn. After a few months, the pictures are no longer needed; the children have internalized the instructions and are able to listen and wait their turn without the visible reminders.

An example of a *Tools of the Mind* activity where executive-function development is the primary focus is social pretend play (such as playing doctor and patient or grocery store). Mature make-believe play challenges and helps build all three core executive functions: Children must (a) *inhibit* acting out of character (someone who has chosen the role of the 'baby' in a scenario cannot all of a sudden get up and drive the car), (b) *hold in mind* their role and those of others (when planning a robbery, you do not want to accidentally inform the policeman; you must remember who has which role), and (c) *flexibly*

adjust in real-time as their friends take the play scenario in directions they never imagined.

A core aspect of *Tools of the Mind* is that minimal time should be devoted to 'large group activities' (where the teacher is talking and the children are gathered as a group, passively listening). Rather, *Tools of the Mind* emphasizes learning through doing, having children actively involved in using the information and actively interacting with other children in doing that in groups of 2, 3, or 4.

Scaffolds, such as the simple line drawing for *Budding Reading*, enable children to practice skills they would not otherwise be able to practice. If a teacher assumes that children are not capable of something and so structures the class so that the children never need to do that, they will not get any better at that because they are not getting an opportunity to practice. If a teacher, with the same assumption, scaffolds or supports the children to help them perform at a level they could never perform at on their own, then they get practice (and the pride of doing something that may have seemed far beyond their reach) and through repeated practice, they improve.

I used to think drills a waste of time, but I was wrong. Repeated practice is the only way to move things from prefrontal cortex to older brain regions. No one learns to play a musical instrument well without hours and hours of practice. No one becomes a chess master without hours of practice. Schoolchildren need hours and hours of practice so that simple sums and multiplication become second nature, so the skills of reading become automatic, and so that skills of attention, concentration, self-control, and memory become finely honed.

Activities that address all three components of what I have laid out as the goal of education are *service activities*, activities where one is working to help one's own community or people further afield. These are acts of caring and generosity, but they also require forethought and planning, perseverance even in the face of initial setbacks, creativity and flexibility when unexpected obstacles or opportunities arise, and putting into use what one has learned in school. It could be raising funds for an important cause, such as the *Pennies for Peace* program that grew out of Greg Mortensen's work portrayed in the book, *Three Cups of Tea*. One penny at a time, schoolchildren (grades K to 12) throughout the West are raising funds to build schools in remote areas of Afghanistan and Pakistan. While a penny is practically worthless in the West, in impoverished communities it can buy a pencil and open the door to literacy. "Kids are really connecting to the idea that there are kids that don't have a school or don't have a choice about getting an

education" (Bouthillette, 2010). Children realize they are part of something bigger than themselves that is having a major positive impact. "No other factor even comes close to matching the cascade of positive changes triggered by teaching a single girl how to read and write" (www.penniesforpeace.org). Here, another example:

> In many of [our] school, we found that our own SOS children from the SOS Children's Villages performed poorly compared to their classmates as they appeared unable to overcome their history of abandonment, trauma or abuse, poverty and previously inadequate care, even though they now lived in a nurturing environment in our SOS Children's Villages. The SOS President, Mr. Helmut Kutin, believed that it was possible to reverse this trend…Twenty years later, we have graduated over a 1000 students both SOS and non-SOS who have since studied in all the best universities. What [we] sought to achieve was for the students to know that they have a mission beyond academic success and that their talents and skills could serve both Africa and the wider world; the service element of our programme was a key element in this process….All students committed themselves to community service projects on a weekly basis….This commitment continues after school and university and there are many projects begun by our alumni including providing incubators for a major teaching hospital, funding of a nurses training school in Ethiopia, [and] paying the bills of indigent mothers in maternity wards in Accra….Perhaps this is also [a] way to tap into the idealism and activism that youth thrives on—they seem to benefit from the sheer happiness of giving something back to society…and I think they need to be given the opportunity for that kind of self-growth. (Margaret Nkrumah, 2010)

The Critical Role of Who the Teacher is as a Human Being and, Not What he or she does, but How he or she does it

Children learn what they live. The teacher's humanity is more important than the teacher's knowledge of content or teaching strategies. A teacher's presence is the loudest lesson children hear. A teacher's actions speak louder than his or her words. What you say has less of an impact than what you do. Also, children learn from role models. Teachers can provide role models of the qualities I take to be the goal of education. If we preach those but do not practice them, our words will have little effect. If we want kind and considerate children, we need to give them kind and considerate role models and we need to give them boundless opportunities to practice kindness.

What are the practical implications of this for teachers? For example, how can a teacher communicate concern or caring? If we want our students to know we value them, if we want to model caring, how might we go about that? We can take the time to listen, really listen, with our whole being:

> [T]he most basic and powerful way to connect to another person is to listen. Just listen. Perhaps the most important thing we ever give each other is our attention. And especially if it's given from the heart. When people are talking, there's no need to do anything but receive them. Just take them in. Listen to what they're saying. Care about it. Most times caring about it is even more important than understanding it.
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> We connect through listening. When we interrupt what someone is saying to let them know that we understand, we move the focus of attention to ourselves. When we listen, they know we care…. I thought people listened only because they were too timid to speak or did not know the answer. A loving silence often has far more power to heal and to connect than the most well intentioned words. (Rachel Naomi Remen, *My Grandfather's Blessings*, 2000)

> Listening is the oldest and perhaps the most powerful tool of healing. It is often through the quality of our listening and not the wisdom of our words that we are able to effect the most profound healing. (Rachel Naomi Remen, *Kitchen Table Wisdom*, 1996)

> The principal form that love takes is giving of your time, and truly listening. When something is of value to us we spend time with it. When we love our children, we give them our time.... True listening, total concentration on the other, is always a manifestation of love.... Your willingness to listen is the best possible concrete evidence of your esteem that you can give your child. There is no better and ultimately no other way to teach your children that they are valuable people than by valuing them….When children know that they are valued, they feel valuable….That knowledge is worth more than any gold…..This feeling of being valuable is the cornerstone of discipline because when one considers oneself valuable one will take care of oneself in all ways that are necessary. Self-discipline is self-caring. (Scott Peck, *The Road Less Traveled*)

If we want teachers to model caring behavior for our children, we must address and reduce teachers' stress, and we must not make them feel so pressed for time that they cannot take the time to be with a student as they would like and as children need. If we want teachers who can care

for our children, it is important that teachers also receive caring and support. An example of a program that addresses this need is the *CARE for Teachers* program (Jennings, *in press*), which trains teachers in techniques such as mindfulness to help them reduce stress, feel calmer, and in general have a better sense of well-being. Along with that improved inner strength comes feeling more open, more aware of and sensitive to the needs of others, and more emotionally responsive. This markedly changes the climate in the classroom, bringing more joy into the classroom and into teachers' lives. *Tools of the Mind* uses a different strategy to reduce stress. Because children in *Tools of the Mind* exercise better executive functions (including better self-control), teachers do not have to worry about things getting out of control; they can relax. Without having to worry about being reprimanded by the teacher for misbehaving, the children can relax. There is palpably more calm, and more joy, in a *Tools of the Mind* classroom.

How can a teacher communicate respect for his or her students? If we want children who are self-confident, what can a teacher do to foster that self-confidence? Pride and self-confidence come from seeing yourself succeed at something that you thought difficult. Teachers need to provide the opportunities for children to do things that enable children to believe in themselves, i.e., *do-able challenges*. It is useless to tell a child that you believe in him or that he should have self-confidence in the absence of providing opportunities for him to see *for himself* that you believe in him enough to let him try something that is truly a challenge and to see for himself that he can succeed. Children gain pride and confidence, not by our letting them get away easily, but by holding them to high do-able standards, perhaps standards that we provide scaffolds for to help them succeed initially. See Kenneth Clark below and the writings of Robert White (1959), M. Brewster Smith (2003), and Mihaly Csikszentmihalyi (1991). To return to the *Buddy Reading* example in *Tools of the Mind*, instead of the embarrassment of not being able to enact the listener role, a simple line drawing of an ear enables children to have the pride of being a good listener. Rather than letting children flounder and experience failure and criticism, *Tools of the Mind* teachers provide scaffolds so that each child, whatever his or her level of ability, is able to succeed. The boost to self-confidence and self-esteem from experiencing success may be key to the success of *Tools of the Mind*.

> [My teachers]…demonstrated their respect for your humanity by holding you to standards…. [A] child needs to sense from his teachers that they respect him as a person. And the only way he can

> see that is through his accomplishments and through teachers providing the parameters for accomplishment. (Kenneth Clark)

One way to help students feel that 'they own' an understanding, to have the pride that they achieved it through their own efforts, instead of just receiving it handed down from the teacher, is to *not* perfectly tie up all the loose-ends in a lecture, leave some ends dangling unfinished. If we leave things a little unfinished for students to ponder and complete themselves, not only does that keep students thinking about the lecture longer (the Zeigarnik effect; Baddeley, 1976; Zeigarnik, 1967), but it gives them the opportunity to make their own discoveries. The pride, self-confidence, and excitement that comes from discovering for themselves, from figuring things out for themselves, is priceless.

We also help students develop self-confidence through our expectations of them. If we communicate through our actions, through our demeanor, and yes, even through our words, that we have confidence in a student, that goes a long way toward helping the student have confidence in herself. How do we know if we are bright or capable? In part it is through seeing our performance and in part it is through how we think others see us (Mead; Cooley). "If my teachers think I can do this, then maybe I can." Not only that, but our expectations have a powerful effect on how a student actually performs, so our expectations affect (a) a student's self-perception, self-confidence, and expectations for him- or herself, and (b) the student's performance, which the student then looks at for behavioral evidence, which helps shape his or her self-perception and expectations for the future. *Expect a student to perform well; and the student* will *perform well.* The classic, though partially flawed study, *Pygmalion in the Classroom* (Rosenthal & Jacobsen, 1968), showed this in a very powerful way.

For our study of *Tools of the Mind* reported in *Science* (Diamond et al., 2007), our testers were not supposed to know which program a child was from. However, our testers reported back that they could always tell which children had been in *Tools of the Mind* because when it came to the most difficult test conditions, control children tended to give up, but *Tools of the Mind* children kept saying, "I know I can do this." Where does the attitude, the confidence, that if you persist, if you vary your strategy or try harder, you'll succeed come from?

Tools of the Mind teachers make mistakes on purpose in class and talk about what you can learn from that mistake. They are taught to do

this on purpose so they can model not being embarrassed by one's errors. *Tools of the Mind* teachers have weekly learning conferences where teacher and child evaluate the child's work together. They discuss effort: How many times did you try? What did you do when you tried? The teacher helps the child set an attainable and measurable goal. 'Doing my best' would not be a measurable goal, but writing one more sentence or remembering one more fact would be. A child can then evaluate progress toward that goal the following week. The conferences have an upbeat, positive tone; they establish that you use your errors to learn from; they are valuable. That the child will succeed is never in doubt, it's just a matter of how and when.

To an educator who might be feeling, "Geez, there are so many ways I can mess up," my advice is not to worry, relax. As long as what you are doing is coming from the right place, from genuine love and respect for your students, pretty much whatever you do will work out for the best. Do not sweat the specifics.

The Critical Role of What gets Rewarded and what the Society at Large Values

Children see who people look up to. They see who gets praised and held up as role models. If we want children to grow up to be compassionate and civic-minded, they need to see concretely that that is valued. We give awards for the Best Scholar and the Best Athlete, but too rarely for the Most Selfless Student. They see teachers getting evaluated by the academic test scores of their students, not by the humanity or kindness of their students. We need to regularly recognize students for doing good deeds, for taking the initiative to help at a local or global level. We need to regularly recognize school personnel (*all* school personnel, including the janitor, cook, librarian, etc.) for best personifying the human values we aspire to inculcate in our students. It is not that one should do the right thing *in order* to get a reward, or that every good deed should get rewarded, but students should see very concretely that it is at least as important to be a good person as it is to be bright or athletic.

The Critical Role of Attitudes

I touched on this briefly above when I spoke about expectations and self-confidence. I would like to touch on attitudes in a few different ways here. The one most related to what I spoke about above is one's attitude toward mistakes. Mistakes can be feared as the source of intense embarrassment and as evidence of one's inability to succeed,

evidence of one's insufficiencies. The best way to avoid mistakes, disconfirmed hypotheses, and poor grades is to stick with what you already know. Venture at all into the unknown and you risk making a mistake. Indeed, Einstein famously said, "Anyone who has never made a mistake, has never tried anything new." The only way to grow and progress, however, is to venture beyond what you already know. Therefore it is terribly important to inculcate in students the attitude that it is okay to be wrong and, indeed, everyone messes up sometime. Indeed, the wonderful thing about a disconfirmed hypothesis is that you learn something new. Confirmation of your hypothesis only tells you you were right. It is only when you are surprised that you learn something you did not already know.

A poor grade, a wrong answer, can be the occasion to give up, or to try harder, try a different strategy, or ask for help. Samuel Massie was born in Little Rock, AR in 1919, the grandson of slaves. One can only imagine that he encountered his share of prejudice and setbacks. Yet he persevered and in 1966 he became the first African-American professor at the US Naval Academy. He was named one of the best chemistry professors in the US and one of the 75 premier chemists of the twentieth century, along with Marie Curie, James Watson, and Francis Crick. In 2002 the US Dept. of Energy chose to name its Chairs of Excellence in the environmental sciences in his honor. Samuel Massie's attitude toward mistakes was, "You've never failed until you've tried for the last time, and you've never lost until you quit." What a wonderful attitude to aspire for all our students to have.

If you think that ability is the primary determinant of how well a person will do, and that ability is genetically determined, then if you get a poor grade, that indicates you lack the ability and you might as well give up. If, however, you think that hard work and effort are primary determinants of grades, then a poor grade is merely an indication that you need to work harder or try a different strategy. Students with that attitude would be inclined to persist in the face of failure and to seek academic challenges to help them grow and improve (Dweck, 1999, 2006).

The truth is that evidence indicates that *IQ (i.e., ability) is over-rated.* Discipline appears to account for over twice as much variance in final grades as does IQ (Duckworth & Seligman, 2005). Indeed, Côté & Levine (2000) found that IQ did not predict academic success at all in university students. Similarly in young children, executive functions (especially self-control) are more strongly associated with school

readiness and school success than are IQ or entry-level reading or math (Blair & Razza, 2007).

A second attitude is related to the importance of learning through doing, the importance of letting students discover things for themselves, and my injunction to teachers to relax. Our powers are limited and in the end, students need to own the knowledge themselves. We can try to help, but when all is said and done, it is the students' work; we are only helpers.

> No gardener ever made a rose. When its needs are met a rosebush will make roses. Gardeners collaborate and provide conditions which favor this outcome. And as anyone who has ever pruned a rosebush knows, life flows through every rosebush in a slightly different way. (Rachel Naomi Remen)

The next quote is about therapy, but it applies equally well to education:

> Therapists' work is more like that of a mid-wife….When the baby is born, there is no question to whom it belongs….Lao Tzu says that when the sage is at work, people will say 'they did it themselves.' This is empowerment (Johanson & Kurtz, 1991: 29, 38-39).

Our first reaction when a child is not grasping a concept or new skill is usually to think it is the child's deficiency. "If only the child were brighter, she would have grasped what I am trying to teach." It is critical that we never forget our own role in the learning process and that different people learn in different ways. When a child cannot succeed on one of my executive function measures, I always ask, "How can I present the material differently so he or she can succeed?" Not surprisingly, I usually find a way so the child can succeed, even occasionally halving the age when success is first seen (e.g., Diamond, Churchland, Cruess, & Kirkham, 1999; Diamond, Kirkham, & Amso, 2002). A shift of perspective can be helpful in teaching. If a child isn't getting something, what might I, as the teacher, do differently? How can I present the material differently, or word the question differently, so that this child can succeed?

> The motto of a local school for children with dyslexia and other learning challenges is, "If you can't learn the way we teach, we will teach the way you learn.

Prefrontal cortex makes it possible for us to selectively attend, being on the lookout for the information we think relevant and important and able to inhibit distraction. However, when we are selectively attending for one thing, we may well miss critical information because we were looking for something else. "Our notions of what *should* happen [can] block us from seeing what actually *does* happen" (Bernie Glassman, *Bearing Witness*). What we are looking for in part determines what we will see. Therefore, an attitude of openness, of non-expectation as much as possible, of willingness to seize on serendipity is very important. For example:

> A friend's son was in the first grade at school, and his teacher asked the class, "What is the color of apples?" Most of the children answered red. A few said green. Kevin, my friend's son, raised his hand and said white. The teacher tried to explain that apples could be red, green, or sometimes golden, but never white. Kevin was quite insistent and finally said, "Look inside."

For the last two attitudes I will address, I would like to focus on ones that relate to compassion and to humility. It is to drop all arrogance about how wonderful we are because of our accomplishments. No one accomplishes anything by his or her own efforts alone. We have people helping and supporting us, in looking up facts, in cheering us on, in cooking our meals, in short, in a myriad of ways. "None of us has gotten where we are solely by pulling ourselves up from our own bootstraps. We got here because somebody—a parent, a teacher, an Ivy League crony or a few nuns—bent down and helped us pick up our boots" (Thurgood Marshall). Even more important, in my mind, is to appreciate the role of luck. Sure I work hard, but others might not look favorably on my work just because of the zeitgeist, my experiments though well planned could come up with null results, etc. Everything I have and have achieved is a *gift.* It is not that I would have received the gifts had I not tried and worked hard, but my efforts could just as easily not have borne fruit. That they bore fruit is a gift for which I am deeply grateful. Where did new, creative ideas I came up with come from? Moreover, each of us in lucky in so much more….

> ...that when we got sick, we got better.
> ...that when we fell, we did not hurt ourselves more.
> ...that when we walked in front of a car or took our eye off the road while driving, we weren't killed.

> ...that others have forgiven our slips of word or deed.
> ...that when we were down and out, someone showed us kindness.
> ...that when we made something, the pieces fit together.
> ...to have seen so much in our lives, even if we never moved.
> ...that our work has sometimes met with favor in the eyes of others.
> ...that when we thought we could not go on any further, we found the strength to continue.

If we are ever mindful of this, it makes it less easy to be condescending toward others. Are we really so much better? And, it helps us remember that "there but for fortune go I." Those of us who are lucky enough to have should share our good fortune with those less fortunate. Those of us lucky enough to grasp a concept or learn a new skill should help those who are still trying to master it. Our luck could turn. One day we may be the one who isn't grasping what someone is trying to tell us or who is 'down on our luck.' and then we would welcome a helping hand, a compassionate soul. Also, remembering all the many things you have to be grateful for, makes it less likely you will feel deprived and wish others' unhappiness because you are unhappy yourself. Instead, remembering all the things to be grateful for helps cultivate a generous spirit.

It is also easier to have a generous spirit and to be forgiving if we bear in mind that mean, hurtful behavior often comes from hurt, sometimes very deep, grievous hurt. Harry Stack Sullivan (1953) talked about the 'malevolent transformation.' This occurs when a child allows himself to be open and vulnerable (as children often are) and is met with rejection, perhaps ridicule, and perhaps worse. Early hurt brings the expectation of future hurt, and so the child hardens himself and decides to push others away before they have a chance to push him away. He now appears to be absolutely awful (mean, obnoxious, uncaring), but that is not coming from being a bad person, but from having been so very deeply hurt.

> The developmental course changes….The child learns, you see, that it is highly disadvantageous to show any need for tenderness, in which case he shows something else; and that something else is the basic malevolent attitude, the attitude that one really lives among enemies….The juvenile makes it practically impossible for anyone to feel tenderly toward him or to treat him kindly; he beats them to it, so to speak. And this is the development of the earlier discovery that the manifestation of any need for tenderness [brings] anxiety or pain. (Harry Stack Sullivan, 1953)

Where Didactic Teaching can be of Great Value, but also a Word of Caution

Once students have had experience, an explicit, verbal teaching can be immensely effective in helping students reflect on their experience and see things they might have missed. I remember the first time I encountered Buddhist teachings on negative emotions. It made so much sense because I could immediately see the wisdom of it by reflecting on my experience. Who is the person harmed by a grudge? The primary victim is the holder of the grudge. That person is holding onto anger and resentment, tying himself up in a knot, while the intended target of the grudge is merrily going about his business. How dumb to punish oneself by holding a grudge. Let it go. We create enemies by treating others as enemies. Treat others with kindness and respect as friends, and you will make friends. To a large extent we create the world we live in.

The cautionary note can be illustrated by a bit of a problem with another Buddhist teaching. Many Buddhist teachings are centered around the curse of selfishness and how we should not have concern for our own happiness but only for the happiness of others, even be willing to take on their suffering and give them our happiness in exchange:

> All the suffering in the world, comes from the desire for one's own happiness….
>
> Exchanging self and others means switching these two so that instead of being primarily concerned about our own happiness we become more concerned for that of others, and instead of neglecting others we neglect ourselves and strive for enlightenment for their benefit….Eventually we'll feel compelled to take their suffering on ourselves and give them our happiness. This is what giving and taking means—giving happiness to all beings and taking on all their suffering—and we practice it in an attempt to destroy our self-cherished mind. (Geshe Jampa Tegchok, 2006)

That is a teaching from males probably intended primarily for males. Girls, at least in the West, are often brought up that they should be completely self-sacrificing, concerned only for the welfare of others and not for themselves (A. Balint, 1953; Chodorow; Gilligan, 1982). They need a different teaching, the teaching that they matter too.

The point of this example is meant to be more general than a gender difference. I am trying to illustrate that children are coming from

different starting points, especially children from different cultures, and the teachings that they need will vary. We need to be keen observers and listeners so that we can try tailor lessons to what children need to hear and improve on.

IMPORTANCE OF EDUCATING THE WHOLE CHILD: COGNITIVE, EMOTIONAL, SOCIAL, AND PHYSICAL

We are not just intellects, we also have emotions, social needs, and bodies. The different parts of the human being (cognitive, emotional, social, and physical) are fundamentally interrelated. It follows that academic achievement, social emotional competence, and physical and mental health are fundamentally and multiply interrelated. I propose that programs that address the *whole child* (our cognitive, emotional, social, and physical needs) will be the most successful at improving any one of them. That is, if your goal is *only* to improve academic achievement, the best way to achieve that goal is *not* to focus narrowly on academics alone, but to address children's emotional, social, and physical development as well.

There are strong reciprocal relations between emotion and cognition, for example. More learning occurs in happy, joyous classrooms, where children feel safe, secure, and accepted, and where they feel the teacher sees them for who they really are and genuinely cares (Gregory & Weinstein, 2004; Harter, 1996; Roeser, Eccles, & Sameroff, 2000). Children can then dispense with the dual-task of always looking over their shoulder, of trying to contain their anxiety, anger, or hurt, while they are trying to learn. They can risk trying something new and maybe being wrong. Children need to feel safe enough to push the limits of what they know, to venture into the unknown, to risk looking foolish. Joy is not the opposite of serious. Serious learning can and does occur in joyful classrooms. Similarly, one does not need to be miserable in graduate school to be learning and benefiting from the education.

Think of how much more, and more quickly, anything is learned when you tap into something a student is passionate about. Emotions can be the engine to power great strides in learning.

On the other hand, even mild stress floods prefrontal cortex with dopamine and norepinephrine and impairs executive function performance (Arnsten, 1998; Cerqueira et al, 2007; Roth et al., 1988). It can make it almost impossible to concentrate, learn anything new, or exercise discipline or self-restraint. Stressed children are sometimes

reprimanded by teachers or parents for actions that are really stress reactions, rather than intentional misbehavior. They may very much want to behave properly, but are not able to do so. Such children can be misdiagnosed as having ADHD, when what they really have is stress. Reducing stress in the classroom not only reduces teacher burn-out and improves classroom climate, it also leads to better academic outcomes (Denham et al., 2010; Downer et al., 2010; Jennings & Greenberg, in press; Jethwani-Keyser, 2008).

Prefrontal cortex can be important in coping with stress, especially after things calm down a bit. Translating a stressful experience into language (talking or writing about it) alters the way it is represented and understood in our minds and in our brains. It increases prefrontal cortex activation which decreases the stress response in the amygdala, and eases our distress. Jamie Pennebaker (1990) has repeatedly shown that even if people just write about their problems (presumably less efficacious than talking about their problems to a sympathetic other), their psychological and physical health improves. Lieberman and colleagues (2007) have shown that just getting participants to assign a single-word label to the fear or anger displayed by another person, reduces amygdala activation and increases prefrontal cortex activation.

We are not just thinking and feeling beings, we are also social beings. Just as our brains work better when we are not feeling stressed, our brains work better when we are not feeling lonely or socially isolated—and that is particularly true of prefrontal cortex and executive functions. Feeling excluded or as if you do not belong has been scientifically shown to impair reasoning and decision-making, decrease persistence on difficult problems, and impair selective attention in the face of distraction (Baumeister, DeWall, Ciarocco, & Twenge, 2005; Cacioppo & Patrick, 2008; Twenge, Catanese, & Baumeister, 2002). In one study, Baumeister, Twenge, and Nuss, (2002) told a group of participants they'd have close relationships throughout their lives, told another group the opposite, and told yet another group unrelated bad news. On simple memorization problem that do not require executive functions, the groups performed comparably. On logical reasoning problems, however, where executive functions are required, participants told they'd be lonely performed significantly worse than the other two groups. Campbell and colleagues (2006) just asked people how they felt, they did not try to manipulate that. They found that prefrontal cortex worked less efficiently while people did mental math in those who felt lonely or isolated.

> I am convinced that one of the reasons why you can see African children living in poverty and playing in the dirt of the streets with no toys still laughing joyfully, while their counterparts in the West who have every material comfort still seem unhappy and unfulfilled, is the strength of the community structure surrounding those African children….. [A] child is not the sole responsibility of his or her parents but of the community—all adults can and do reprimand or embrace that child; a funeral involves not only the whole extended family but work colleagues,…In other words, you are not alone and perhaps that is why even with seemingly nothing, joy is possible. (Margaret Nkrumah, 2010)
>
> Ubuntu speaks particularly about the fact that you can't exist as a human being in isolation. It speaks about our interconnectedness. We think of ourselves far too frequently as just individuals, separated from one another (Desmond Tutu, 2008)
>
> A traveler through our country would stop at a village and he didn't have to ask for food or for water. Once he stops, the people give him food, entertain him. That is one aspect of Ubuntu but it will have various aspects. Ubuntu does not mean that people should not enrich themselves. The question therefore is: Are you going to do so in order to enable the community around you to improve? (Nelson Mandela)
>
> [C]hildren are never orphans since the roles of mother and father are by definition not vested in a single individual with respect to a single child. Furthermore, a man or a woman with [ubuntu] will never allow any child around him to be an orphan (Stanlake Samkange, 1980).

Just as our brains work better when we are not feeling stressed or lonely; our brains also work better when we get exercise and are physically fit, and this again is disproportionately true for prefrontal cortex and executive functions. Improved physical fitness robustly improves cognitive and brain function, with prefrontal cortex and executive functions showing the greatest benefits (Hillman, Erickson, & Kramer, 2008; Hillman et al., 2009). "[T]he positive effects of aerobic physical activity on cognition and brain function [are evident] at the molecular, cellular, systems, and behavioural levels" (Hillman et al., 2008: 58). "Physical activity-related modulation is disproportionately larger for task components that necessitate greater amounts of executive control" (Hillman et al., 2008: 61).

Intervention studies find that increased participation in physical activity leads to better cognitive skills and better grades. A large, 2-year physical-activity intervention with over 4,500 elementary-school

children produced significant improvements in children's math and also improvements in their reading scores (Hollar et al., 2010). Budde et al. (2008) found that among 13-16 year-olds randomly assigned to physical exercise or a control group, those in the exercise group improved more in selective attention and concentration (executive functions). Coe et al. (2006) found that among sixth-graders randomly assigned to condition, those who got enough exercise to meet at least some of the Healthy People 2010 guidelines for vigorous activity had higher grades than students who performed no vigorous activity. When the results from many studies were pooled in a meta-analysis, a positive clear relation between physical activity and both verbal skills and math emerged for all ages (4-18 years) and especially for those 13 years of age or younger (Sibley & Etnier, 2003).

There are only so many hours in the day, and teachers have so much academic content to cover, how can they possibly find time to also address social, emotional, and physical development in addition? It does not have to be in addition. All can be addressed at once. For example, instead of teaching high school physics by lecturing, what about having the class restore an old sports car? That requires that students apply principles of physics and so they have a good reason for learning those principles. Not only is it hands-on, it engages students' enthusiasm and emotions, it requires physical activity and not just mind work, and provides the experience of working collaboratively together toward a shared goal. This involves teaching students in a way they are motivated to learn. Imagine the excitement as they are working on the car, and imagine the beaming smiles of pride when they have finished.

Tools of the Mind activities also organically involve elements that address the various facets of human development. Many kindergarten programs treat social-emotional development (if at all) as separate from cognitive development; *Tools of the Mind*, however, is based on the teachings of Vygotsky (1967, 1978, 1987). Vygotsky emphasized that cognitive development occurs in the context of social development and that social interactions are key to developing intentional self-control. *Tools of the Mind* teachers are taught procedures for implementing paired activities and for creating a positive atmosphere of cooperation and friendship. Children in *Tools of the Mind* do a lot of activities with one or a small number of other children, and each week, every child is paired with every other for at least one activity, reducing social isolation and discouraging cliques.

Vygotsky (1978) observed that children's executive functions originate in social interactions and then later become internalized and

independently used. For example, children need to have an opportunity to engage in other-regulation—regulating another's behavior and pointing out errors another person makes. (It is easier for any of us to see errors in another than in ourselves; developmentally children can detect others' errors before their own.) 'Other-regulation' involves children acting both as subjects of other's regulatory behaviors and as actors regulating others' behavior. For example, in *Tools of the Mind* math activities children alternate roles as 'doers' and 'checkers' (visual symbols indicate who is the doer [a picture of a hand] and the checker [a picture of a checkmark]). In the Numerals Game, the doer has a number card and counts out that number of small teddy bears into a cup. The checker takes the bears and puts them on a checking sheet with the corresponding number of dots. If the bears cover the dots with no extra, the children know the doer was correct. By assuming these roles, children learn to monitor and evaluate the actions of their partner, eventually internalizing criteria and actions they will apply to their own work (Bodrova & Leong, 2007).

Tools of the Mind also embraces the importance of play as aiding academic goals. Schools are under great pressure to cut back on time for play to provide more time for academic instruction. However, children in *Tools of the Mind*, who have more time to play, improve more in executive functions (Diamond et al., 2007) and perform better on academic outcome measures (Barnett et al., 2008) than their peers who have more time in direct academic instruction. Similarly, findings from other programs persuaded the International Association for the Evaluation of Educational Achievement that "young children's cognitive performance at 7 years of age was better for those children who had spent less time in whole-group activities and more time working or playing". (Bracey et al., 2007). Play does not take away time from improving academic outcomes; play helps improve academic outcomes.

Tools of the Mind is multi-dimensional, and I think that is key to its success. It helps children improve their executive functions, reduces stress and increases joy, has children actively doing, and addresses both social and cognitive development.

AN IMPORTANT ROLE FOR THE ARTS IN ACHIEVING THE GOALS OF EDUCATION

Throughout human history, across *all* cultures, storytelling, dance, crafts, and music-making have been part of the human condition.

People in *all* cultures told stories and passed down information by word of mouth, made music, sang, danced, and crafted beautiful creations. If art, music, dance, crafts, and storytelling are simply frills, to be cut when budgets are reduced or to make room for more time for academic instruction, why did they spring up everywhere on earth and why haven't they been weeded out over the long course of human history? They must serve some important, fundamental human needs. There must be good reasons why those activities have lasted so long and been found so ubiquitously. What could those reasons be?

One of the reasons seems to be that they address the whole person. Music-making, singing, and dancing address our physical, cognitive, emotional, and social needs. They challenge our executive functions, make us happy and proud, address our social needs, and help our bodies develop.

I'm a dancer, so let's consider dance as an example. Consider the National Dance Institute (NDI) founded in 1976 by Jacques d'Amboise or the American Ballroom Theater Company's 'Dancing Classrooms' program founded in 1994 by Pierre Dulaine and Yvonne Marceau. Both exercise and challenge executive functions by requiring discipline and persistence, requiring sustained attention and concentration, and by requiring that children hold complex sequences in mind. The programs are great fun but also hold children to demanding standards of excellence. They are also physically demanding and taxing. They build self-confidence and pride through children seeing themselves conquer challenges and achieve what at first looked impossible. The joy and passion when you watch a session is palpable. Moreover, there is a wonderful sense of social belonging and social support. The children help one another, listen to one another, and respect one another. They know that each is an important part of the whole. Sam Gill, who teaches a form of salsa known as *Rueda* in high school, describes how the *Rueda* sessions address cognitive, social, emotional, and physical development:

> I have to admit that when asked to teach dance to teens for the first time a few years ago I did so reluctantly….I imagined a group of lethargic kids whose attention would be difficult, if not impossible, to hold. Was I ever wrong!...I never cease to be amazed by how teens respond to this dance form, the extent to which it actually & perceivably transforms the lives of teens, & how it creates community based on such values as cooperation & inclusiveness & tolerance & joy & all this accomplished among the most diverse &

> motley collection of teens… I am stunned by how quickly & happily these kids learn & how eager they are to learn & help one another learn….It meets the needs of youth in remarkable & powerful ways…Dancers exert themselves physically & mentally at levels far beyond what [I had thought] possible. Students' attention is highly focused & for a much longer period of time than [I had thought possible].
>
> …The pace and demands of dancing require full presence….The music does not stop; the calls come constantly, so there is no space to space out, to loose attention, even to reflect on how a dancer is doing….When a move is called, the entire group must do the move simultaneously and accurately in the prescribed rhythmic structure….[D]ancers must listen for the 'call' and react immediately with the appropriate actions. [In the particular style of Rueda that Gill teaches, all dancers dance both lead and follower roles equally. They must not only remember what movement pattern goes with what call, but whether they are currently a follower or leader, and that can change several times in a dance.]
>
> …The dancers become a community, with a clear understanding that everyone's participation is equally important.….Without ever mentioning 'community,' dancing Rueda provides an experience that is most fun & satisfying as a successfully working community. The rewards of the community are in the experience of doing things as a group that an individual could never do alone….[T]here is a tacit understanding that everyone dances with everyone else. This is an important bodily experienced understanding of community.
>
> …Sooner or later every student finds him- or herself lost in the dance or going in the wrong direction, and will appreciate a softly spoken word or a light push or pull from another dancer. Such gentle mutual assistance is an important, yet tacit, part of the dancing. It tells dancers it's okay to mess up; it's okay to help; it's okay to be helped. (Gill 2009)

There are few scientific studies of the benefits of dance for other than fitness, posture, or balance. Two noteworthy studies have been conducted with older adults. Verghese et al. (2003) examined the effect of leisure-time cognitive- or physical-activity on the incidence of dementia. At the study's outset all participants were at least 75 years old and dementia-free. Five years later, reading or doing crossword puzzles was associated with a 35% reduced risk of dementia. None of the physical activities offered protection against dementia—except dance. *Dance conferred the greatest risk reduction of any activity, cognitive or physical—a 76% reduced risk of dementia*. Kattenstroth et

al. (2010) studied the impact of many years of regular, amateur ballroom dancing on neurologically healthy elderly people, compared to education, gender, and age-matched controls with no record of dancing or sports. The dancers performed better on the Raven Matrices (a measure of fluid intelligence very highly correlated with executive functions [Duncan et al. 1995, 2008; Jaeggi et al. 2008]) and on a nonverbal executive-function measure of selective attention and concentration.

IMPLICATIONS FOR GIFTED EDUCATION?

If our values and our goals include more than intellectual brilliance alone, then it should follow that there are multiple ways to be gifted, multiple dimensions on which one might be gifted. If the best way to encourage development in any one domain (cognitive, social, emotional, or physical) is to encourage development in all, that has implications for education of gifted students as much as it does for the education of any students. Tom Boyce (2007; Boyce & Ellis, 2005) talks about 'orchid' and 'dandelion' children. Children identified as gifted are among our orchids. 'Dandelions' are those children who do okay wherever they are planted. They are often identified as models of resilience. The amazing thing is that research shows that some of the children who look the worst when they are in an unsupportive, stressful environment are exactly those children who blossom the most when in a good environment. For example, our research and those of others (Diamond et al., 2004; Egan et al., 2001) show that children or adults who are homozygous for a version of the COMT (catechol-o-methyltransferase) gene that has methionine (Met) at codon 158 tend to have higher levels of dopamine in prefrontal cortex and show better executive functions. However, other research shows that they are also more sensitive to and disturbed by stress (Zubieta et al. 2003). It is possible that children who are homozygous for the other version of the gene (the version with valine at codon 158) are likely to be dandelions. They are more robust in the face of stress but do not have the fine-tuning of prefrontal cortex to achieve the brilliance of which a Met-Met child might be capable. The Met-Met child might look like a disaster when in a stressful environment, but might be the star of a gifted program if in the right environment.

Very little is fixed or unchangeable. Fully 90% of our genes are switched off. To a large extent, our experiences, and our reactions to them, determine which genes get turned on (and off), when this

happens, and which remain on or off (Szyf, McGowan, & Meaney, 2008). Experience sculpts and changes the brain throughout life. Therefore, 'brain-based' does not mean immutable or unchangeable. Executive functions depend on the brain, yet they can be improved by the proper activities. Exercising and challenging executive functions improves them (Diamond et al. 2007; Lakes & Hoyt 2004; Mackey et al. *in press*; Olesen et al. 2003: Rueda et al. 2005; Thorell et al. 2009), much as physical exercises hones our physical fitness.

Students (even gifted ones) who view their intelligence as unchangeable tend to shy away from academic challenges, whereas students who believe that their academic performance can be improved through effort and persistence seek out challenges and thus improve more (Dweck, 2000). Similarly, teachers who view academic ability as fixed will be more inclined to give up on students who are not currently performing well. However, discipline, motivation, and academic excellence are not fixed, we can strive to help children improve those. We should forever be seeking ways to present the material differently, engage our students more, change our attitudes or expectations, or whatever it takes so that each and every child is able to shine in his or her own unique way.

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