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COMMENTARY

# The Evidence Base for Improving School Outcomes by Addressing the Whole Child and by Addressing Skills and Attitudes, Not Just Content

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If we want the best academic outcomes, the most efficient and cost-effective route to achieve that is, counterintuitively, *not* to narrowly focus on academics, but to also address children's social, emotional, and physical development. Similarly, the best and most efficient route to physical health is through also addressing emotional, social, and cognitive wellness. Emotional wellness, similarly, depends critically on social, cognitive, and physical wellness.

We must always keep our eyes on the goals of education. If the goal of education is not simply the memorization of facts, then we must stop focusing on the memorization of facts in our assessment measures, for what gets assessed is what gets emphasized. If success depends 90% on attitude and effort, only 10% on ability, we must foster can-do attitudes and self-confidence in our students. If the goal of education includes clear reasoning, critical thinking, and creative problem-solving,

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we must give children, day in and day out, opportunities to solve problems on their own, question assumptions. and reason their way to solutions. If the goal of education includes responsible, caring citizens, then we must give children opportunities, day in and day out, to be responsible and caring, and we must ensure that teachers are not so stressed that they are unable to provide caring role models for our children.

A human being is not just an intellect or just a body; every one of us is both—and we are not just cognitive and physical, but also emotional and social. We ignore any of those dimensions at our peril in raising and educating children. Programs that address the whole child (cognitive, emotional, social, and physical needs) are the most successful at improving any single aspect—for good reason. For example, if you want to help children with academic development, you will not realize the best results if you focus only on academic achievement (though at first glance doing that might seem the most efficient strategy); counterintuitively, the most efficient and effective strategy for advancing academic achievement is to also nurture children's social, emotional, and physical needs. Donald Hebb famously responded, when asked which was more important for development, nature or nurture, by asking, "Which contributes more to the area of a rectangle, its length or its width?" Contributors to this issue similarly are in unanimous agreement that it makes little sense to ask, "Which is more important for healthy development (or even more narrowly, important for success in school and one's career), nurturing cognitive abilities or social and emotional ones?" They are intimately intertwined; nurturing both is of fundamental importance for the furtherance of either and to success in school, career, and life (see, e.g., Nadeem et al., this issue).

Moreover, we need to keep our eye on the goal. The goal of education is not the memorization of obscure facts. Yet inevitably, that is what content-based multiple-choice tests assess. A second theme running through the papers in this volume is the inadequacy, indeed harmfulness, of exclusive reliance on content-based standardized tests.

## THE FUNDAMENTAL IMPORTANCE OF SOCIAL, EMOTIONAL, AND PHYSICAL HEALTH FOR COGNITIVE HEALTH

The core executive functions (working memory and inhibitory control [including attentional control, Rueda et al., this issue; and discipline]) are the fundamental building blocks out of which the more complex executive functions, such as cognitive flexibility, critical thinking, creative problem-solving, and incisive reasoning are built (Diamond, 2006; Thompson & Gathercole, 2006). They rely

on a network of brain structures, the kingpin of which is prefrontal cortex (Diamond, 2002).[1]

[1]Perhaps it is appropriate to say something about the differences, similarities, and overlap between related concepts used by authors of papers in this special issue: executive functions, self-regulation (e.g., Eisenberg, this issue), effortful control (Eisenberg, this issue; Rueda et al., this issue), executive attention (Rueda et al., this issue), and working memory.

"Executive functions" is a term referring to a set of cognitive functions involved in the top-down control of behavior in the service of a goal (Diamond, 2006; Espy et al., 2004; Hughes, 2005; Miyake et al., 2000; Pennington, 1997; Zelazo & Mueller, 2002). They are needed whenever going "on automatic" would be insufficient or detrimental. They include (a) inhibition at the level of attention and inhibition at the level of action (such as selective attention [inhibiting distraction], staying on task despite temptations not to [discipline], and giving the considered or appropriate response rather than the impulsive one [self-control]) and (b) working memory (holding information in mind and working with it, such as relating what you just did to the response you received, what you learned last year to what you are hearing now, or what you read earlier in a sentence or a novel to what you are reading now; it also includes doing mental arithmetic and holding in mind what you want to say or ask while you continue to listen to a speaker). Historically, executive functions have primarily been assessed directly from the child's behavior, on arbitrary laboratory-based tests, and executive-function researchers have generally focused on emotions as a problem to be controlled through effort (Blair & Diamond, 2008).

"Self-regulation" refers primarily to emotional control and regulation (Eisenberg, this issue; Eisenberg, Spinrad, & Eggum, 2010; Mischel, & Ayduk, 2002; Raver, 2004; Rothbart & Jones, 1998). To some extent, it overlaps with the inhibitory control component of executive functions, in that both self-regulation and executive functions embrace controlling one's emotions, though even here executive-function researchers have focused more on the inhibition of thoughts, perceptions, and actions, and only more recently have included emotional control. Unlike the term "executive functions," self-regulation also embraces the importance of motivation and alertness—emotional responses to be encouraged. Self-regulation researchers view emotions as equal partners in the learning process and in the achievement of one's goals. Historically, self-regulation has primarily been assessed through adult ratings of children's behavior, observed over the course of time at home or in school, though of course there has also been direct empirical observation using, for example, the tasks of Mischel et al. (1989) and Kochanska et al. (2009).

"Effortful control," coined by Rothbart (Kieras et al., 2005; Posner & Rothbart, 1998; Rothbart, Ellis, Rueda, & Posner, 2003; Rothbart & Jones, 1998; Rothbart, Sheese, & Posner, 2007), refers to an aspect of temperament, a genetic predisposition, along a continuum—to be predisposed to exercise inhibitory control or self-regulation with ease (e.g., easily able to slow down or lower one's voice) versus finding that harder or less natural.

"Executive attention," coined by Posner (Posner & DiGirolamo, 1998; see also Fan et al., 2002; Rueda, Posner, & Rothbart, 2005), refers to the top-down regulation of implicit or explicit perception (endogenous attention) as opposed to "alerting" (maintaining a state of high readiness to attend to potential stimuli) and "orienting" (exogenous attention—being pulled by a stimulus to attend to it). One would think that executive attention would correspond to the executive-function subcomponent of inhibitory control at the level of attention (e.g., selective, focused, and sustained attention). Indeed, when assessed by measures such as the "flanker task," where one is to focus on the center stimulus and ignore the flanking stimuli, it is indeed used in this way (Fan et al., 2002; Rueda et al., 2005). However, much confusion has been engendered by the overly broad use of the term "executive attention," even by someone as truly brilliant and beloved as Posner. To my mind, attention refers to the regulation of the information we take in—focusing on one thing rather than another and staying focused—allocating mental resources so one concentrates on one stimulus, or set of stimuli, rather than another. Executive attention should not be used to refer to response inhibition (whether to press on

the left or right) nor cognitive flexibility (switching from sorting by one dimension to another). Executive attention, to my mind, should not be used to refer to the resolution of any kind of conflict, but only conflict at the level of attention or perception. For example, on a task such as the "Simon Task" (press right for Stimulus A and left for Stimulus B, regardless of whether A or B appear on the right or left), the challenge is not to control one's attention; the challenge is to control where one responds. Such tasks therefore should not be called "executive attention" tasks (e.g., Gerardi-Coulton, 2000; Jones, Rothbart, & Posner, 2003).

Executive-function researchers refer to working memory as a subcomponent of executive functions.. There is disagreement among executive-function researchers on whether inhibition is independent and separate from working memory or whether inhibition is a behavioral product of exercising working memory and not a separate cognitive skill (e.g., Diamond, 2006; Miyake et al., 2000 versus Kimberg & Farah, 2000; Morton & Munakata, 2002). Many working-memory researchers, on the other hand, use the term "working memory" far more broadly so that essentially it becomes synonymous with executive functions. For example, Engle and Kane define working memory as the ability to (a) maintain selected information in an active, easily retrievable state while (b) blocking or inhibiting other information from entering that active state (i.e., memory maintenance + inhibition; Conway & Engle, 1994; Kane & Engle, 2000; 2002). Similarly, Hasher and Zacks (1988; Zacks & Hasher, 2006) emphasize inhibitory components of working memory: (a) gating out irrelevant information from the working-memory workspace and (b) deleting no-longer-relevant information from that limited-capacity workspace. A large literature has assessed working-memory development and function using "complex span tasks" (also called "working memory span tasks"; Bailey, Dunlosky, & Kane, 2008; Barrouillet et al., 2009; Chein & Morrison, 2010; Conway et al., 2005; Pardo-Vázquez & Fernández-Rey, 2008; Unsworth et al., 2009). Those tasks require more than just holding information in mind and manipulating it. They require multiple subcomponents of executive functions. I think it would cause less confusion were they called executive-function tasks. When reading a study of working memory, inhibition, attention, or executive function, one should look carefully at the requirements of the measures used, at what did subjects actually had to do.

Our thinking and our brains suffer if we are lonely or feeling socially isolated, and that is particularly true of executive functions and the prefrontal cortex on which they rely (Cacioppo & Patrick, 2008). Feeling excluded or as if one does not belong has been shown in controlled experiments 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; Twenge, Catanese, & Baumeister, 2002). For example, Baumeister, Twenge, and Nuss, (2002) told one group of study participants that they would have close relationships throughout their lives, they told another group the opposite, and they told unrelated bad news to a third group. On simple memorization questions that do not require executive functions, the groups performed comparably. On logical reasoning problems, however, that do require executive functions, participants told that they would be lonely performed significantly worse. Campbell and colleagues (2006) found less efficient activity in prefrontal cortex while doing mental math in participants who felt isolated.

Similarly, our thinking and our brains suffer if we are feeling stressed, and that is disproportionately true of executive functions and prefrontal cortex. Even mild stress floods prefrontal cortex with dopamine and norepinephrine, impairing how prefrontal cortex works and thus impairing executive functions (Arnsten, 1998;

Cerqueira et al., 2007; Roth et al., 1988)—just as flooding your car engine with gasoline impairs your car's ability to function (though appropriate levels of gasoline and appropriate levels of dopamine and norepinephrine are absolutely critical to the functioning of your car and prefrontal cortex respectively). Other brain regions that rely on these neurotransmitters do not show this devastating effect in response to mild stress, only prefrontal cortex. Reducing stress in the classroom reduces teacher burn-out, improves classroom climate, and leads to better academic outcomes (Jennings & Greenberg, 2009; Jethwani-Keyser, 2008; see also Denham et al. and Downer et al., this issue).

Conversely, more learning occurs in a joyous classroom, where children feel safe, secure, and accepted, and where they feel the teacher sees them for who they really are and genuinely cares. Children can then dispense with the dual-task of always looking over their shoulder, of trying to contain their anxiety, anger, or hurt feelings while they are trying to learn. Instead, they can take the risk of trying something new and of being wrong. When we find out we were right, we are not learning anything new. It is only when we are surprised that we learn something we did not already know. Children need to feel safe enough in school to push the limits of what they know, to venture into the unknown, to take the risk of making a mistake or being wrong. Albert Einstein said, "Anyone who has never made a mistake has never tried anything new." What a shame that so many schoolchildren are so terrified of being embarrassed by a mistake that they are afraid to try anything new.

Our thinking and our brains also suffer if we do not get enough exercise or are sleep-deprived, and that is disproportionately true of executive functions and prefrontal cortex. 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). Our brains work better when our bodies are physically fit, and this is particularly true of prefrontal cortex and executive functions: "Physical activity-related modulation is disproportionately larger for task components that necessitate greater amounts of executive control" (Hillman et al., 2008: 61).

The same or substantially overlapping brain systems are important for both cognitive and motor functions (Diamond, 2000; Rosenbaum et al., 2001). The brain does not recognize the same sharp division between cognitive and motor function (or cognitive and emotional functioning, or social and emotional functioning, and so on) that we impose in our thinking. For example, the pre-supplementary motor area (pre-SMA) is important for sequential tasks, whether they are sequential motor tasks or sequential numerical, verbal, or spatial cognitive tasks (Hanakawa et al., 2002). If the functioning of a brain region improves through motoric exercise and challenge, it stands to reason that it might function better for other things as well, such as cognitive challenges.

During sleep, we extract patterns from the day's experience, we summarize, consolidate, and distill the gist from the day's lessons, and we seek out relations between new information and experiences and what we already know or have experienced. During sleep, what is important becomes enhanced and unnecessary details discarded. Not getting enough sleep prevents these educational gains (Stickgold, 2009; Stickgold & Wehrwein, 2009; Walker & Stickgold, 2010).



## WHY THE EASY WAY OUT (LECTURES FOLLOWING BY STANDARDIZED MULTIPLE-CHOICE TESTS) MISSES THE MARK

To paraphrase Alexander (this issue), some of the most critical goals of education are to produce citizens able to reflect deeply on critical issues, having the skills to deal effectively with the many demands of a rapidly changing world, and retaining their native curiosity, excitement about learning, and hunger for knowledge. How can that best be achieved?

If I asked you who would learn and remember a route better—the driver or the passenger in the car?—you would not hesitate for a moment in answering, "The driver, of course, for the driver is actively navigating the route while the passenger is passively sitting there." A great deal of research in psychology has demonstrated that principle and ancient traditions have long appreciated it (e.g., Olson, 1964; see inset box). Yet, we seem to forget this when we put students in school. No one—from a first-grader to a college senior—learns as well passively listening to a lecture as he or she learns by actively using that information. Many business schools (and recently, more and more medical schools) have heeded the evidence and embraced problem-based learning, but too few undergraduate, primary, or secondary schools have done so.

Action, hands-on learning, is even more important for the youngest children, who are not biologically equipped to sit still, especially boys. Boys are dropping

> "I hear, and I forget.
> I see, and I remember.
> I do, and I understand."
> a Chinese proverb
>
> "That which is learnt through the mouth is forgotten. It is through the soul that we learn. The soul repeats it in the heart, not in the mind, and only then do we know what to do."
> —Manuel Arias Sojob: Interview with Guiteras Holmes, 1961

out of school at alarming rates in the United States, and there is grave concern about having sufficient educated workers for the workforce (Heckman & Masterov, 2007). One possible reason for the higher dropout rates among boys is that boys find it harder to sit still for extended periods than do girls.

Some people are auditory learners, while others are visual or kinesthetic learners. Active learning involves the whole body, all the senses. We evolved to be able 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, and we do not pay as close attention when there is no obvious relevance or immediate need for it (Olson, 1964). My son showed me how to program the VCR and I thought I understood. When I went to program the VCR I realized, to my chagrin, that I had not learned what my son had tried so patiently to teach me. The same is true when we teach children in school. They need opportunities to concretely apply what they are being taught. Think of the excitement that would be engendered by teaching high school physics in the context of auto mechanics. Such learning is not only hands on, it not only engages student's cognitive and motor functions, it also engages their emotions; it involves teaching students in a way they are motivated to learn.

As teachers, there is a certain satisfaction in delivering the perfectly wrapped-up lesson, no loose-ends left dangling. We need to keep our minds always on the goal, however. The goal of student learning is best furthered if everything is *not* perfectly wrapped up, if we leave things a little unfinished for students to ponder and complete themselves (the Zeigarnik effect; Baddeley, 1976; Zeigarnik, 1967). Not only does this keep students thinking about the lesson for far longer, 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 out things for themselves, is priceless. The following quote is about therapy, but it applies equally well to education: "When a therapist has no investment in …looking good as a therapist, or some other personal agenda, she can be open….Therapists' work is more like that of a midwife….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" (Johnson & Kurtz, 1991: 29, 38–39).

One way to empower students, to give them self-confidence, is to give them doable challenges, opportunities to succeed at things they know are difficult. For example, if a kindergarten teacher assumes that children of only 5 years of age are too young to exercise self-control or self-regulation, and so structures situations so that the children do not need to exercise self-regulation, that provides the children no opportunity to practice self-regulation and to thereby get better at it. If a kindergarten teacher provides 5-year-olds with opportunities to exercise self-control and self-regulation, but provides no supports or scaffolds to help children's inchoate self-regulation abilities, the children will likely fail. However, if a kindergarten teacher provides scaffolds (such as visual reminders of what one should do, as, for

example, a line drawing of an ear for the child in the listener role with the admonition that "ears don't talk; ears listen"), then even 4-year-olds can successful exercise the self-control to listen and wait their turn (Bodrova & Leong, 2007; Diamond, Barnett, Thomas, & Munro, 2007). Instead of being scolded for being poor listeners, they have the pride of being been a good listener. That pride and self-confidence sets in motion a powerful positive dynamic—for if we are confident, if we believe we can, we will often succeed (just like *The Little Engine That Could*). Unfortunately, it is also true that if we believe we cannot succeed, we often will not. Researchers have given students *exactly* the same test, changing only the sentence or two they said beforehand that affected students' expectations. Students succeeded when told that people like them do well on the task but alas did poorly when told that people like them tended not to do well on the test (see, e.g., Aronson et al., 1999; Steele & Aronson, 1995; see Box 2).

Teachers' expectations are part of the students' social world. Teachers' expectations have powerful effects and shape students' expectations for themselves. A teacher's expectations for student achievement are at least as important as the teacher's knowledge of the subject matter (Rosenthal & Jacobsen, 1968). Students will master the material if their teacher expects them to master it. When children cannot succeed on an executive function measure, I always ask, "How can I present the material differently so they can succeed?" Not surprising, I have always found a way so they succeed, even halving the age when success is first seen (e.g., Diamond, Churchland, Cruess, & Kirkham, 1999; Diamond, Kirkham, & Amso, 2002). A school in British Columbia for children with dyslexia and other learning challenges has as its motto, "If you can't learn the way we teach, we will teach the way you learn."

Teachers' attitudes about the relative importance of ability and effort also subtly shape students' expectations for themselves. Students who believe that ability is what matters most, that ability is fixed at birth ("it's in the genes") and that there

**ATTITUDE**

**by Charles Swindoll**

The longer I live, the more I realize the impact of attitude on life. Attitude, to me, is more important than facts,…than the past, than education, than money, than circumstances, than failures, than successes, than what other people think or say or do. It is more important than appearances, giftedness or skill. It will make or break a company…a church…a home. The remarkable thing is, you have a choice every day regarding the attitude you will embrace for that day. We cannot…change the fact that people will act in a certain way….The only thing we can do is play on the one string we have, and that is our attitude….I am convinced that life is 10% what happens to me and 90% how I react to it.

is little you can do to improve it, often quit as soon as the going gets rough (they think, "Obviously, I am not smart enough to succeed and might as well give up") and worry that failure (even having to work hard) will be perceived as evidence of their low intelligence. Therefore, they make academic choices that maximize the possibility they will get an A. Unfortunately, this also minimizes the chances that they will be significantly challenged to push the limits of their ability and knowledge. Other students attribute their successes and failures to something under their control. In the case of difficulty or failure, they believe that one need only try harder, try another approach, or seek help. Thus, they persist in the face of failure and seek academic challenges to help them grow and improve their academic skills (Dweck, 1999, 2006).

What gets assessed is what ends up mattering. Policymakers want to see the numbers, the data. Only what there are numbers for (hard data) get included in the policymaking equation. Therefore, decisions about how educational achievement will be measured and what will go into assessment measures are of absolutely vital importance. In an absolutely terrific paper in this issue, Alexander (2010) explores and explodes several educational myths. The first myth she attacks is that performance on high-stakes tests equates to learning. There are many reasons why that myth is pernicious.

It is true that content (discrete facts) are easier to assess via multiple-choice tests than are problem-solving, clear thinking, or creativity. It is also true that grading multiple-choice tests is far easier and takes far less time than grading open-ended questions and essay exams. But if what we really care most about are thinking and problem-solving skills, then taking the easy way out will simply not do. Moreover, we are not simply intellects; we also have emotions, and it turns out that girls' emotions get in the way more (girls get more anxious) when taking high-stakes tests than is true for boys. The upshot is that girls consistently get higher grades in their courses in school than do boys but lower grades than boys on high-stakes standardized exams (Duckworth & Seligman, 2006). Reliance on standardized test scores underestimates girls' level of educational attainment and their promise for future advancement. Within the same school, those with the higher course grades are far more likely to do better in college than those with the higher standardized test scores (Duckworth & Seligman, 2006). Moreover, teachers are afraid to concentrate on what really matters (critical thinking, creative problem-solving, and incisive reasoning) because they feel so much pressure to stuff facts into students' heads in preparation for the standardized exam in the spring. Teachers told to ensure their students perform well on a high-stakes exam are more controlling in their instructional strategies and end up having students who perform worse than teachers given the mandate to facilitate student learning (Flink, Boggiano, & Barrett, 1990; Flink et al., 1992).

I will close by coming full circle. The goal of development, the goal of schooling, must be more than intellectual brilliance—a point echoed by all the papers in

this issue regardless of the subdiscipline or perspective of an author. In her paper in this issue, Alexander quoted Martin Luther King as saying that an education that stops at teaching students to think intensively and creatively "may prove the greatest menace to society. The most dangerous criminal may be the man gifted with reason, but with no morals" (1947: 10). As educators and policymakers, we *must* be concerned with social and emotional development. What do we want most for our children? We want our children to grow up to be good human beings. What do we need to do to foster that outcome? There are two main things. One is to be a role model of that ourselves. What we have children do is probably less important than who we are (Kessler, 2000; Palmer. 1995). A teacher's presence while he or she is in the classroom is the loudest lesson children hear. If we want children to be less stressed in school, if we want teachers to model responsible and caring behavior for our children, we must address and reduce teachers' stress levels.

Second, children learn what they live. The James–Lange Theory of Emotion (James, 1884; Lange, 1887) argued long ago that if you act like you are good, you will become good. It is true that the greatest joy comes from making others happy. The way for children to learn that truth is for children to experience it—to regularly, every day, do simple things to be nice to others, whether it is holding the door for someone carrying a heavy load, letting someone get ahead of them in line, saying "hello" or "thank you" to someone handing them their lunch, or complimenting someone's smile—and experiencing how absolutely terrific they feel when they receive a smile in return. It is immediately intuitive that if you want others to be happy, you should be kind and considerate toward them. It is initially counterintuitive that if *you* want to be happy, you should be kind and considerate toward others. Children only learn the truth of that by experiencing it. If we want more kind and considerate children, we need to give them kind and considerate role models, and we need to give children boundless opportunities to practice kindness and to experience for themselves how happy making someone else happy makes them.

It all comes back to the importance of action for learning and the fundamental interrelatedness of the different parts of the human being (the social, emotional, cognitive, and physical parts) and of all human beings to one another. Academic achievement, social–emotional competence, and physical and mental health are fundamentally and multiply interrelated. The best and most efficient way to foster any one of those (such as academic achievement) is to foster all of them. Each of the diverse disciplines specializing in any aspect of these has an important piece of the whole to contribute. We need to see the human being and human development as one whole, that those who care deeply about developing cognitive competence, social skills, emotional wellness, or physical health and fitness are not in competition, that one component is not more important than any another, and that we have much to learn from the insights and accumulated wisdom of our counterparts in other fields and specialties.

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