UNIT 2: THE UNITY OF EMOTION, THINKING, AND LEARNING

Section 1: Survival

Q: What is emotion, and why do we have it?

The streets were quiet and dark when rehearsal ended at 2:00 a.m. and Dan started walking to his car. The School of Communications and Theatre had been built on the edge of campus, a relatively new incursion into an inner city of mostly abandoned buildings and smoldering resentment. Normally if people left the building after dark, they called security, which would send a few officers to create an illusion of activity and safety. But tonight, Dan was alone.

As he reached the top of the street where he had parked his car, he saw, down at the other end of the block, two figures pass beneath one of the few dim street lights that still worked. A slight glint reflected from a piece of metal in the hand of the second figure. They wore sweatshirts with hoods, and they turned up the street toward Dan. "Oh, hell," he thought, "this isn't good." He had started toward them at just about the same time they turned toward him. Dan glanced at a walkway that went off to his right toward another university building, dark and empty but perhaps with an unlocked door. A moment of decision. He didn't turn, and he and the figures kept walking toward each other into deepening darkness. Dan's heart raced, and he began to sweat a bit.

Just before he reached his car, the two young men stopped him.

"Got a quarter?" the one in front of Dan asked. The other stood behind him, and carried a large crescent wrench in his left hand. "Sure," Dan said and thrust his hands into his jean pockets with the sudden realization that he was a moron, standing there, both hands trapped, while some guy with a wrench stood behind him. He fumbled with the change he felt in one pocket, quickly producing a coin. "Oh, that's just a nickel." Babbling now, he desperately felt around for a quarter, found one, gave it to the guy in front of him, and stepped out from between them toward his car, as they moved to continue up the street, laughing at Dan, mocking him. He felt that a game had ended—a game that he was doomed to lose. In one outcome

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he lived, and in the other he died. Dan sat in his car feeling sick, shaking, simultaneously filled with fear and elation, and wondering what had happened. Why had he walked toward them? How had he survived? All he could come up with then was that he had been lucky, which was part of it but not all of it.

Today, thanks to insights from neuroscience, we can understand that Dan's emotions saved him. In fact, that's the purpose of our emotions: to keep us alive. This idea that emotions are essential to our survival may be startling; most of us tend to think of emotions as simple (though often powerful) feelings, like joy, sadness, anger, and fear. However, from a neurobiological and evolutionary perspective, emotions are
behaviors and thoughts that are automatically triggered in certain contexts, either real or simulated. Emotions are physical manifestations of our reactions to what is happening around us—the increased heart rate, sweating, gestures, facial expressions, and vocal noises. And emotions produce thoughts about what we will do, thoughts, in a general sense, of moving toward or moving away from the thing that has triggered our emotion. If the trigger offers pleasure (social connection, hope, reward), we usually approach; if the trigger threatens, we typically move away or try to make the threat move away.

Measuring Emotional Response to Physics

Guilherme Brockington, a doctoral student at the University of São Paulo, explores emotional links to physics. He measures relative changes in skin conductivity when experts and novices view...

View video
Section 2:
Just remember that ant

Q: What is "street smarts"?

Take the lowly ant, a simple, nonconscious organism whose behavior and "thinking" are automatic, innate, reflexive responses to stimuli. Each day, it ventures out, genetically programmed to search for crumbs of food to carry to its nest. As it returns along a sidewalk gripping its scrap, it senses the shadow of a large foot, and immediately it scurries into a crack to avoid being stepped on. Once the danger has passed, it continues on its way back to its nest. Clearly, the "decisions" (in the ant's case nonconscious and automatic) to carry the food, to hide to avoid being crushed, and then to continue in the direction of its nest are primitive instances of cognition. Each decision is composed of complex packages of innate responses that enable the ant to react advantageously to particular kinds of situations (moving toward sustenance, fleeing threats). What is essential to understand is that these primitive examples of cognition, the ant's "decisions" and behavior, act together in the service of an emotional goal: to maintain and promote stability and fitness (survival).

Humans, of course, are more complex. In threatening situations like the one in which Dan found himself on that dark city street, we can either decide to flee it to save ourselves or to confront it to save ourselves. However, Dan's decision to move forward was not the result of some sort of rational deliberation during which he consciously weighed his options. He didn't have time.

Sitting in his car immediately after the confrontation and thinking about it later, he realized that emotion had guided his responses, and subsequent reflection has allowed him to make some sense of the emotional decisions he had made that resulted in his survival. His body had become more awake and alert; and though he was really scared, he walked with a confidence that struck him in retrospect as odd but essential. He couldn't appear frightened. That was the reason he didn't take the path to the right toward that other building. It would have signaled that he was running and invited them to chase him.

When they asked for a quarter, he was able to control his voice so that it seemed casual and tired; he knew that both fear and any disrespect would be disastrous, though he made these decisions so quickly that it's difficult now to call them decisions.

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Also informing Dan's behavior was the knowledge that, a few months prior to this moment, a classmate had been killed in a subway station when he refused a request for a cigarette. He had been shot, and subsequent investigations suggested that he had been the victim of a game in which the assailant asked for a cigarette and if the victim gave him one, the victim lived; if he didn't, he died. Dan felt that story
flicker through his consciousness as soon as he was asked for a quarter.

So he was very lucky to have had a quarter (he doesn't smoke), but his behavior and his thoughts during those few seconds were the result of his emotional goal: to survive. Emotion is a form of decision-making. While the decisions of ants are little more than genetic responses to triggers in the environment (finding crumbs of food, avoiding being squashed), people learn from experiences and develop a repertoire of actions that allow them to respond appropriately to different situations. As our world becomes more complex, particularly our social world, so do the situations with which we must deal. If we have good mentors, whether they are parents, older peers or caring teachers, our responses become increasingly sophisticated and nuanced, and we develop the "street smarts" we need to function effectively.

The Amygdala

"The amygdala is basically your brain's burglar alarm. It keeps you alive and lets you know whether you need to fight or..."
– Dr. Abigail Baird

View larger image
Q: Why do we experience threats to our identity so powerfully?

Although the modern jungle poses more threats from drunk drivers, gang-bangers, and grifters than from the occasional grizzly bear, our emotions continue to work to protect us not just from contemporary predators, but also from the new dangers of the more complex social and cultural jungle we have created. In essence, we have reinterpreted survival, adding a new layer of social well-being to our continuing need for physical well-being. Today, threats to our social identity are experienced every bit as keenly as our primitive ancestors experienced physical threats; both use the same neural and chemical mechanisms. "My parents are going to kill me if I fail this course." "I'll die if I don't get into Stanford, if he doesn't ask me out, if I don't make the team, if I'm not invited to her party." On one level, these are metaphorical rather than literal expressions, but on another level they bespeak real fears of social "death." We all know stories of young people who killed themselves rather than face social humiliation.

We also know stories of inspiration and great compassion—stories of young people whose emotions have moved them to help others. Consider Pam, for example, a student from an urban neighborhood who grabbed the chance to leave the poverty and violence of her home, where, in her words—"opportunity and advancement were stifled by underfunded schools and withered dreams"—and attend a better school. There she found an adult whose belief in her taught her to "believe in someone else's story and invest in that person's life," a lesson she now applies to young people with whom she works in other cities. Pam's emotional response to the world, based on powerful experiences that have shaped her values, compels her to choose an identity that gives her a sense of well-being and health by helping others.

Human societies have become amazingly complex social and cultural worlds that expand our definition of survival. Most of the decisions we make today determine whether we will flourish or perish in this socially and culturally constructed reality. Lev Vygotsky got it right. There is a culture that shapes our ends. Why does a high school student solve a physics problem, for example? The reasons range from the intrinsic reward of having found the solution to getting a good grade, to avoiding punishment, to helping tutor a friend, to getting into a good college, to pleasing parents or the teacher. All of our private reasons for succeeding at physics have a powerful emotional component and are connected both to pleasurable sensations and to survival within our culture—to living happily in a social world to being loved and respected. Our emotions make us social animals.

Although what we mean by surviving and flourishing is interpreted in a cultural and social framework, our
brains still work to achieve their original purpose: to adapt and manage our bodies and minds in the service of living. These emotional goals continue to operate using our primitive neural machinery (albeit with cortical upgrades) which connects our emotions to our thinking and behavior. We think in the service of emotional goals; the goals that matter to most of us—those that keep us alive both physically and socially—are what motivate us to thought and action.

Dr. Mary Helen Immordino-Yang

"I don't like to think of emotion and cognition as separate things. There's thinking. And thinking has an emotional aspect, and it has a cognitive aspect. You can analyze one aspect or..." — Dr. Mary Helen Immordino-Yang

View larger image
UNIT 2: THE UNITY OF EMOTION, THINKING, AND LEARNING

Section 4:
Making the case

Q: Doesn't emotion just get in the way of rational thinking?

Phineas Gage (the man whose brain was damaged by a tamping iron driven through his skull, described in Unit 1) may well have provided an early example of the connection between emotion and cognition.

However, for over a hundred and fifty years since his accident, conventional wisdom has doggedly insisted that reasoning plays the critical role in governing behavior and that emotions are a largely female distraction that need to be banished to the edge of the settlement to ensure that order is maintained.

Then, in the 1980s, Dr. Antonio Damasio, current director of University of Southern California's Brain and Creativity Institute, and others began looking at patients who had sustained damage to emotion-related brain areas and discovered that they could not explain the resulting irrational behavior through cognitive deficits alone.

Like Gage, these patients became oblivious to the consequences of their actions. Although their apparent understanding of social conventions and rules remained intact, their behavior nevertheless violated these norms and reflected no sensitivity to the feelings of others; they also lost the ability to learn from their mistakes. For example, although a formerly able business executive still understood and could explain the risks of an impending deal, he made one disastrous decision after another and eventually destroyed his company. At home, this once affectionate husband no longer offered sympathy to his wife, who had always been able to rely on his support, and his marriage fell apart. Eventually, researchers' attention focused on one particular group of patients whose ventromedial prefrontal cortex had been compromised.

These patients seemed to retain their ability to reason and to recall social rules, even to explain the sort of conventional behavior that might be expected in various social situations. Their knowledge base was intact. They could speak intelligently about future planning or business decisions. However, their ability to make good decisions or to apply the rules of conventional behavior was clearly impaired. It soon became apparent that they could no longer use emotional understanding from past experiences to guide their decisions and behavior in the present.

As we live our lives, we make decisions

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and act, and the results teach us about the wisdom or folly of our actions. In effect, we "tag" the consequences of our behavior and store them as emotional knowledge to guide us when we find ourselves in similar situations, faced with the need to make decisions about what we will do this time.

Knowing that drinking and driving are not a good combination is one thing; slamming a car into a house at 40 mph after a night of beer and shots adds an emotional dimension to the rule and makes it more likely that our next decision about drinking and driving will be more "reasonable." This is not to say that
experience is the only teacher, for we also learn from emotions that result from imagining the consequences of our behavior.

Patients with ventromedial damage lose the ability to behave rationally because they have lost their emotional rudder. It turns out that reason without emotion is every bit as terrifying and useless as we have always claimed that emotion without reason is. Not only are these patients unable to use emotional tags from past experiences to make good decisions, they are unable to learn from and tag new experiences, so they continue to make one bad decision after another. They have lost the essential connection between emotion and cognition that results in meaningful rationality. When emotions are disconnected from rational thinking, the abilities to think, make decisions, and learn are impaired. It seems that for the village to function, emotions and thinking must live together in the same hut and work together to make sense of the world and to function intelligently in it.

Good Idea?

Prof. Abigail Baird of Vassar College discusses how fMRI studies reveal differences between teen and adult brains when considering dangerous behavior. Evidence suggests that emotion plays a critical...

View video
Q: How does emotion help me solve problems?

The relationship between emotion and thinking is captured nicely in the unified idea of emotional thinking, a process that can be conscious or nonconscious and that is often both at the same time—as it was the night Dan was asked for a quarter. Emotion guides cognitive learning, as is demonstrated in the Iowa Gambling Task, described below by Mary Helen Immordino-Yang and Matthias Faeth in "Building Smart Students: A Neuroscience Perspective on the Role of Emotion and Skilled Intuition in Learning."

A participant in a study sits at a table with four decks of cards before her. Her task is to choose cards from these decks. With each card she draws, she has the chance to win some amount of money. Unbeknownst to her, certain decks contain cards with larger wins than other decks, but these same decks also result in occasional enormous losses that make them a bad choice in the long run. The participant must learn to play this game by deducing the "cognitive" rules for calculating and weighing the relative long-term outcomes of the different decks. An examination of the player's performance reveals that the process of learning how to play the game involves both emotional and cognitive processing and begins with the development of (generally) non-conscious emotional "intuitions" that eventually become conscious rules that she can describe in words or formulas. The development and feeling of these intuitions are critical for successful, usable knowledge to be constructed.

As she begins the game, she at first randomly selects cards from one deck or another, noting wins and losses as they come. But soon, before she is even consciously aware that the decks are stacked, she begins to show an anticipatory emotional response in the moment before choosing a card from a high-risk deck: her palms begin to sweat in microscopic amounts, measured as "galvanic skin response." Unconsciously, she is accumulating emotional information about the relative riskiness of some decks. As she proceeds, this emotional information steers her toward the 'safe' decks and away from those with high gains but the possibility of large losses. After playing for a while longer, she accumulates enough information about the decks that she is able to describe the rule governing which decks to play and which to avoid, at which point we would say that she has "learned."

The Iowa Gambling Task and other experiments have taught neuroscientists about the importance of emotion in the learning process, an importance that probably applies not just here but to math learning, social learning, and learning in various other arenas in which people must accumulate information from their experiences and use this information to act advantageously in future situations. Emotion guides the learning of our participant much as a rudder...
guides a ship. Though this guidance may not be visible, it provides a force that stabilizes the direction of a learner's decisions and behaviors over time, helping the learner to recognize and call up relevant knowledge—for example, knowledge about which deck to pick from or which math formula to apply.

Students struggling with a math problem—or writing, social, or other problem in which they are engaged—draw upon memories of past experiences with similar math problems, searching for strategies that might apply to this new problem. Is it like a distance-rate problem? Can I express it in a quadratic equation? As we approach a solution, we experience a series of small emotional "jolts" of recognition that lead us to feel we are on the right path; we are getting warmer.

Essentially, we feel our way to solutions to problems that matter to us, and that are emotionally relevant to us because we experience them as essential to our physical or social well-being. How do I learn organic chemistry so that I can become a doctor? How do I handle all this homework so that I can maintain a GPA that will make my parents happy? How do I find a new metaphor around which to build this poem to express my feelings and share my experiences with others? If the problem doesn't matter to us, we quickly lose interest. Our attention wanders; we disengage, and we learn only that organic chemistry is boring—though if the grade matters, we will most likely learn strategies for getting the grade without meaningfully learning chemistry.

Depth of Field

Photography teacher Eric Baylin struggled with teaching the technical concept of depth of field. After attending a workshop presenting neuroscience research that reveals the neural connection between...
UNIT 2: THE UNITY OF EMOTION, THINKING, AND LEARNING

Section 6: Implications for education

Q: What is the connection between emotion and motivation?

So, there they sat in Karen's office—one disaffected eighth-grader (Molly), her mother and father, her five teachers, her advisor, and the assistant head of school (Karen). Nine adults, nine talking heads all making suggestions, cajoling, pleading, and painting different pictures of the child's future. For an hour, they invented strategies for Molly, offering deals and rewards for behavior that would result in her succeeding in classes that meant nothing to her.

You could tell by looking at Molly that she was bored, annoyed, and defeated, impatient to be elsewhere. She slouched into the sofa, glaring through a veil of blonde hair at the floor. "God," Karen thought, "all these earnest adults doing all this work for this child." And that, of course, was the problem. The adults had the plans and the strategies. What did Molly have? What was her investment in all this? "Molly," Karen said abruptly, "what do you want to do? What do you think the problem is?" Molly looked up, startled, stunned even. She was accustomed to adults talking at her, making plans for her. "Huh?" she grunted, mouth agape, a suggestion of a sneer of incredulity etched into her lips.

School for so many kids is like a tsunami—something that just happens to them. They become passive victims of its power. Teachers droning, bells ringing, chairs scraping, humanity swirling through halls and buffeted from room to room, weighted down with backpacks and expectations, drowning. Too few students experience education as something over which they exercise any meaningful control or that has anything to do with their interests or needs. School is boring or even worse. Yet, if we listen carefully to their voices, we can hear echoes of the lessons that neuroscience teaches us. Like Ian's voice. He, too, hated high school, and saw it as "the state-imposed mandatory four-year sentence. I was waiting for school to end so I could start the real learning and work I wanted to do in my life."

Then he made a life-changing choice. He enrolled in an alternative program that freed him from the usual...
high school requirements and let him study and make films. He spent part of his day away from school at a nearby studio, where he enrolled in film and video classes with adults. For the first time, he felt the excitement of being in a classroom "where everyone was there because they wanted to be."

Ian experienced school as Molly never did, despite all the effort adults made on her behalf. "My program," said Ian, "put 'the system' much more in the student's control. If you failed, you had no one to blame but yourself. All of a sudden, there weren't just dreams or ideas or theories; there were real projects, real deadlines, and real consequences that meant much more to me than getting a low grade on a test."

Teachers know these things about learning. They know that Molly and Ian represent the extremes of a spectrum of meaningful engagement, and they struggle heroically to shepherd their students toward Ian's experience. Neuroscience can help. Perhaps guided by new ways of understanding learning, we can design more learner-friendly schools and experiences for more of our students. Perhaps we can help our students engage in school by encouraging them to take control of their own learning.
UNIT 2: THE UNITY OF EMOTION, THINKING, AND LEARNING

Section 7: Principles to consider

- Emotion is the rudder for thinking, learning, and decision-making.
- Motivation is rooted in emotional relevance.
- Meaningful learning requires three ingredients: factual knowledge, skilled emotional intuition (emotional tags), and practical understanding of the rules or principles governing the specific area of study.
- The purpose of education is to develop students' abilities to recognize the emotional implications of situations and to help them create increasingly nuanced and sophisticated strategies for acting and responding.
- Social and cultural factors are just as significant inside as they are outside the classroom.

Emotion is the rudder for thinking, learning, and decision-making. The inability of patients with ventromedial brain damage to function, rudderless, in the world emphasizes the critical role of emotion in transferring previously acquired knowledge to real-world decision-making and problem-solving. Without these emotional processes, we cannot move the skills and knowledge acquired in school to novel situations and to life beyond school. That is, emotion seems to play an essential role in helping children to decide how and when to apply what they have learned in school to the rest of their lives.

Of course, emotion is needed to acquire this knowledge in the first place in any sort of meaningful sense. Students who can only parrot what teachers tell them haven't really learned anything useful. They may have learned the skills of memorization and regurgitation, but meaningful learning—internalizing concepts and skills and connecting them to emotional goals—results from emotional thinking. It is significant that children who suffer ventromedial damage never learn the social rules that should govern accepted ethical behavior. Adults who learned the difference between right and wrong prior to their injury still know these social rules after the injury. They can discuss them; they cannot put them into practice. But without the emotional connection, children with this brain damage never even learn them. Emotion is essential not just to applying knowledge, but also to learning it.

Motivation is rooted in emotional relevance. Many teachers understand this truth because the emotional relevance of their own studies attracted them to teaching. The courses they now teach allow them to continue to study the Civil War, speak French, solve problems, or look for evidence that local farms are polluting a nearby stream. Teachers love these things: these things matter, they're important. What's important to the students, on the other hand, rarely finds its way into the classroom. Yet, like Ian, those few who do find emotional relevance in their schooling offer convincing arguments for rethinking...
schools.

Consider Ted: "The only thing I felt truly connected to was my poetry writing and English classes. I did poorly in all of the other classes and was on academic probation off and on during my sophomore and junior years. I remember feeling like I wanted to give up if I had to follow the standard coursework that awaited me. I was not engaged, and I desperately needed the freedom that came with a course of study that was created out of my own interests."

Or Andrea: "My motivation changed once I was accepted into this independent program because my interest and involvement with the studies became more personal. I immediately began to think differently about school and what I could do. I felt a brand-new set of doors was opening. I pushed myself because I was motivated to learn more because it was information I was interested in and felt it was important to know."

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**A Student Voice**

(A letter from a high school student to a researcher)

Dear Professor:

I am currently in the eleventh grade. I have been researching your School of Education for the past few weeks, and your field of study in neuroscience and education psychology intrigued me the most. My school and community are extremely focused on academics, including SATs, GPAs, and extracurricular activities intended to create good résumés for colleges. This almost overbearing focus on academia has pushed me to try to understand the reasons for this emphasis and to delve further into the "why" and "how" questions of public education. In studying my school, I began to ask questions about conformity and intelligence. The stereotypes that teachers have of our Asian community made me eager to prove them wrong—to show them our creativity and our abilities beyond memorization and test-taking. I realized the education we were given prepared us purely for middle management in some businesses.

I understand that elementary school and middle school are primarily meant to teach us the basics and provide a foundation, but I could not come to terms with the fact that in high school we continue the same routine: one that suppresses our curiosity and individuality. This year, in my U.S. History class, I was reading about the creation of higher education, which inspired me to research the origins and purpose of education. The system was established to create good citizens, unify society, and teach religion. Also, in order to give voting rights to all citizens, it was necessary that they be educated. I often feel as if we have lost that purpose, and, more importantly, we have lost the enthusiasm for knowledge. The mundane routines of teaching and the strict classroom curriculums and a near obsession, in communities such as mine, with college admissions have replaced a love of learning.

I recently read your piece on the implications of neuroscience for education and the necessity of considering the role of emotional thought processes as a means of attaining our intellectual goals in school. I feel as if this is what my school lacks: an overarching goal, or even smaller goals from topic to topic—an objective that ties together and helps us to understand what we study.

Because of these multiple factors, I have developed an interest in education as an area of study,
Or Cynthia, who described herself as "the type of person who prefers to learn about something that, to me, has relevance. It was clear that those subjects that did have relevance were more interesting; and if I was interested, then the motivation to work and study and learn was there. Basically, once I got going with my program, which entailed working with children with severe special needs at a local nursing home up the road, I felt like my school had meaning, like there was a purpose."

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(Opened ScienceTalk sidebar)

**Affective Neuroscience**

&copy; Patricia Saxler.

*Dr. Joanna A. Christodoulou works at the intersection of education and neuroscience with roles as a scientist (Department of Brain and Cognitive Sciences at Massachusetts Institute of Technology), clinician (Children's Hospital, Boston), instructor/professor (Harvard University; Department of Communication Sciences and Disorders at MGH Institute of Health Professions), and practitioner.*

Even a glance at a person's face or a snippet of conversation can reveal vast amounts of emotional data about how the person feels about a topic. However, masked behind furrowed brows or gleaming smiles is a vastly intricate network of neurons that builds the brain systems responsible for emotion and feeling. The field of affective neuroscience has blossomed to reveal some of those intricacies.

Recall a recent exchange, with a coworker or new acquaintance perhaps, during which time you heard about an experience that was foreign to you. As you hear the story, you wonder... Why would she act that way? Why would he say that? That doesn't make any sense to me. Now, compare your desire to relate that fell short to other experiences, often with close friends and confidants, when you felt that you were "on the same page," ready to complete each other's thoughts, and comforted with the sense that you mutually "get" each other. A major difference between these two types of experiences is our ability to relate, in a socio-emotional context, because we can intuit or virtually experience, or not, the mindset and experience of another. Affective neuroscience studies are beginning to parse out the distinction in these experiences and relate them to the ways in which emotion is experienced and processed in the brain.

The emotional brain, in a sense, relies on the very basic neural structures and systems that allow us to maintain our basic sense of well-being. One distinction to draw is between the physical-emotional (exteroceptive) and the socio-emotional (interoceptive) ways in which we can relate to others. The
Meaningful learning requires three ingredients: factual knowledge, skilled emotional intuition (emotional tags), and practical understanding of the rules or principles governing the specific areas of study. Motivation, purpose, engagement—these are the qualities most teachers long to see in their students, the same qualities that prevent adults from burning out in their jobs, and the same qualities that neuroscience connects to emotional relevance and the central role that emotion plays in learning. Teaching for understanding, cooperative learning, portfolio assessments, differentiated instruction, project and service learning, and online courses are just some of the latest creative solutions many teachers have developed to make their classrooms positive experiences for students. And for some students, these innovations have helped. For others, simply having teachers who care about them as individuals worthy of all this invention has helped.

Yet, the system does not seem to be succeeding. Too many students continue to drop out—if not actually, then effectively; too many learn too little; and too many teachers become frustrated, anxious, and cynical. Our expanded understanding of the brain and how and why it learns suggests that the system may be flawed. At a time when it is fashionable to blame teachers, the critics may be ignoring a deeper problem. If the system is flawed, and if the assumptions and basic structures of schools are at odds with how the

RESOURCES:

brain learns, then all the innovation in the classrooms seems little more than well-intended jerry-rigging.

**The purpose of education is to develop students' abilities to recognize the emotional implications of situations and to help them create increasingly nuanced and sophisticated strategies for acting and responding.** Emotional relevance can have many sources: innate curiosity or ability, the discovery of a new idea through exposure to the rich variety of human endeavor, or the enthusiasm of a parent or teacher. It will always be important for adults to expose young people to the possibilities the world has to offer, and it is useful for teachers to help students connect their studies to their lives. But we must also consider that schools might be so much more successful if they were truly conceived and structured to nurture students' curiosity and encourage them to pursue their interests, changeable though they are—from kindergarten (where children's interests already tend to influence curriculum) right through college (where choosing a major again allows students to pursue a deep interest).

In addition to an emotional goal, meaningful learning requires three ingredients: factual knowledge, skilled emotional intuition (emotional tags), and practical understanding of the rules or principles governing the specific area of study. Factual knowledge alone is useless without a guiding emotional intuition, and intuition grounded in insufficient relevant experience will be equally useless.

**Social and cultural factors are just as significant inside as they are outside the classroom.** From the perspective of affective and social neuroscience, the purpose of education is to develop students' abilities to recognize the emotional implications of situations and to help them create increasingly nuanced and sophisticated strategies for acting and responding. In the area of disciplines like math or history, for example, this means, in essence, helping students begin to think like mathematicians and historians—building a base of knowledge and successful experiences solving problems so that they can become inventive as they feel their way to solutions to increasingly complex problems. Of course, this level of engagement depends upon caring about math or history.

In the world outside the classroom, the goal is essentially the same: to help young people develop increasingly nuanced and sophisticated strategies for acting and responding to whatever life throws their way. While too many young people find little emotional relevance in their studies, they are frequently overwhelmed by their emotions as they navigate the cliques and shifting friendships in the sociocultural jungle of the hallways, cafeterias, and locker rooms, or as they struggle to make decisions about their plans for the future. (It is important to note that these realities of everyday life can make good starting points for engaging students in math or history.)

We all have automatic emotional responses to events and situations, whether real, imagined, or remembered. A fight with a friend, a sad movie, or the memory of recalling a family vacation can trigger an emotion that signals its presence through various physiological changes. Our heart rate changes; we sweat; we feel nauseous or incredibly good; we close our eyes or reach out or hit. These physical changes are accompanied by all sorts of thoughts: I'm no good; I hate her; I am the greatest; how can I get out of here with the least amount of embarrassment? Although these emotional responses are automatic, they are not simple. They are complex responses shaped by our knowledge and experience. Thus, as we mature and have more experiences, our emotions become increasingly complex.

Young people generally are still developing sophisticated ways of understanding or dealing with their feelings and emotions. Often, they misread their or others' emotions—or even trigger an emotion that is
not appropriate to the situation—and miss what is really going on. For example, they can easily misread a comment or facial expression as a threat, especially to their sense of who they are, and can be quickly swept away by negative emotions and accompanying thoughts of worthlessness. These feelings, in turn, can feed off each other and spiral out of control. (How many times have teachers marveled at a student's angry response to what the teacher thought was an innocuous, even supportive comment?) On the other hand, sudden, unwarranted enthusiasm can also lead them quickly astray—into dangerous relationships and behavior.

As we mature and gain more experience, we learn to rethink and reinterpret these reactions in order to build more advantageous ones. The process of maturing involves feeling and understanding our emotions and learning how to change our thinking so that we can induce, regulate, and use our emotions in productive ways. Shakespeare was right: “There is nothing either good or bad but thinking makes it so.” Survival in the sociocultural jungle means feeling good about ourselves in relation to others. If one of the goals of schooling is to socialize young people, then helping them develop strategies for invoking advantageous and appropriate emotions and for feeling, understanding, and regulating their automatic, complex emotional responses is essential.

(Opened ScienceTalk sidebar)

The Work of Marc Brackett

Insulted
You're ugly
I know
I have been told this
You're silly
I know
I have realized this
You look like an alien
I know this has been pointed out to me
You have big eyes
I know I have looked in the mirror
You can't be a pilot
You're not smart enough
It is possible, I have considered this
With every insult you invent, it's strange but it's true
You point out my many failings and help me to improve
As you highlight my many weaknesses you also highlight my strengths
My openness leads to my kind personality
My silliness brings laughter to the world
My resemblance to movie aliens only highlights my intelligence
My big eyes portray my feelings and widen my view
I may not make it as a pilot, but I could be
You see, every insult you invent gives me a view into your mind
And although I have many problems, I feel sorry for you
Why oh why do I feel sorry for you?
Because your mind cannot break free
The wall of insults you build limits your mind and feelings
So soon if you don't stop, you'll turn inhuman
And have the biggest problem of all
Loneliness
Think about it

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Navigating the socio-emotional landscape of childhood and adolescence for many students trumps the most difficult of academic challenges. One challenge, however, is that schools focus on training academic skills and problem-solving strategies, whereas the how-to's for dealing with socio-emotional challenges remain often implicit and unexamined. A child may leave his third-grade classroom knowing how to attack a multiplication problem but have no approach to dealing with the playground bully or his anxiety about his performance on a standardized test. A skilled social butterfly may feel the trauma of failing a social studies test because she fears the repercussions, real or perceived, from her parents and not talk about them. In both cases, the students lack appropriate strategies for navigating how they feel and deciding what they will do with those emotions.

Marc Brackett, a scientist based at Yale University, has dedicated his career to researching, developing, and implementing explicit knowledge and strategies around feelings, emotions, and relationships. The work of Brackett and his team focuses on using and understanding the terms and terrain of the socio-emotional landscape. Impressively, following participation in classrooms that use Brackett's RULER Approach, students and school staff not only add an enhanced vocabulary for verbalizing emotions and feelings, but also learn to judge their own feelings, empathize based on the emotional state of another, and understand intentionality and how emotion and behavior are linked. RULER is an acronym for five key emotion skills: recognizing, understanding, labeling, expressing, and regulating emotion. The benefits of this program have been shown to extend from the socio-emotional realm to academics, classroom climate, and student behavior.

Bringing about change in social and emotional learning (SEL) is not a simple process. To effect such changes requires more than adequate funding or a few teachers with high levels of compassion. To promote a healthier socio-emotional environment for staff and students in a school, Nicole Elbertson, Marc Brackett, and Roger Weissberg (2010) identify some key elements:

- Support of school leadership and active involvement of staff
- Appropriate training of staff members in principles, theories, and practice elements
- Well-coordinated efforts for implementation with adequate treatment fidelity
- Matching school culture and program goals and strategies
We have to take the time to feel our emotions, to feel what our automatic responses to situations actually mean, and to make sense of them. The impact of an emotion on our body and mind alerts us to the meaningfulness of a situation and invites us to make sense of it. For example, Amy participated in an experiment to study reactions to stories meant to induce admiration for virtue. While listening to a true story about a young blind German woman who learns the Tibetan language by ear, invents a Tibetan Braille system, and travels to Tibet to start a school for the blind, Amy's emotional response is visible in her body: widened eyes, erect posture, slow and deep breathing, and open mouth.

At the conclusion of the story, the interviewer asks Amy what she feels, and she responds, "Extremely impressed because she went above and beyond. I think I also just respect her for not only helping herself out of her own situation and making the best of it, but for trying to help other people's situations as well, especially those who are less fortunate. [long pause] I found the story very motivational, too. It kind of makes me reflect upon my own life and realize that considering that I haven't had as extreme, like, uncontrollable circumstances as a lot of these people [whose stories are featured in the experiment]... . It makes me realize, well if they can do that despite, like, whatever hardships they have, then I definitely should be making more of my resources in my life." Clearly, Amy is guided through a process of transforming her emotional response into feelings and meaning and discovering her motivation to seize the opportunities in her own life.

Teachers constantly work with young people to help them understand their reflexive emotional responses. People have emotional triggers, and both teachers and students must be conscious of the potential for firing these. Whether with a more reflective adolescent like Amy or a 7-year-old bully, caring teachers take the time to develop their students' insight into their own feelings so that they can improve their ability to manage emotion and interact productively with the world. If emotion is our rudder, it makes sense to help young people learn to steer their own course and perhaps share William Ernest Henley's claim: "I am the master of my fate: I am the captain of my soul."

It's also important to recognize that social and cultural factors are just as significant inside the classroom as they are outside it. Wherever learning happens, it is not a rational or disembodied process; neither is it a lonely one. Learning is all tied up in our social relationships and our cultural context. We learn with our teachers and our classmates and our parents. This is true even if we are by ourselves. We always function—make choices, interpret meaning, derive motivation—within a cultural framework. At the very least, mom and dad and their expectations are forever within us, whether we are striving for them or reacting against them. We can't check our culture or our emotions or our bodies at the door to clear the way for rational thinking. Schools need to be rethought not as ivory towers of rationality, but as community

**REFERENCES:**

- The RULER Program Website: http://www.therulerapproach.org
centers of emotional thinking.
UNIT 2: THE UNITY OF EMOTION, THINKING, AND LEARNING

Section 8: Resources


