

1

What You REALLY Need to Know About the Brain!

• • •

Mrs. Tina, a kindergarten and first-grade teacher, is very discouraged with her class, and it's only December. The students are so impulsive and talkative that it is hard to teach much, if any, of the curriculum. They don't listen to instructions or pay attention for more than a few minutes. She never gets through her lessons as she intends to and has to cut her lesson plans short to do constant disciplining and reminding students to stop talking and arguing. How will she survive the rest of the year in this noise and chaos?

Mrs. Keller has always loved working with nine-year-olds except this year: Everything is always a big deal with a particular group of girls. There's always one of them taking things personally, being hurt, or being on the verge of tears. When it's not taking insignificant comments as a personal offense or assuming that others intentionally wanted to hurt them, it's discouragement because they don't think they can do a math assignment. She is exasperated with them, and it's becoming hard to hide it. What can be done to help these girls have a more positive attitude, increase their tolerance for everything, and feel more confident about themselves?

Marvalee is wondering if she should keep on teaching or not. Fifth grade is loaded with a huge curriculum, which in and of itself would be manageable if she could teach in a straightforward way. She is still interested in education but is tired of doing peer mediation between students and the weekly handling of insidious teasing and bullying. She wishes that students would just get along better and let her do her job. Is this possible?

Mr. Konure has five years of experience working with middle-school teenagers and has, for the most part, managed well. This year, however, he has Jerry. Jerry makes just about everything hard. He is unpredictable, and has out-of-control days when he blurts out unpleasant comments, interrupts constantly, and says mean things to his peers. Mr. K. has tried everything: conversations, deals, threats, rewards, consequences, consulting, talking to his parents, and so on. Nothing seems to make a difference. If anything, the problems may even be worse as they now clearly dislike each other, and Jerry's peers have also started being openly impatient with him and excluding him. How can Mr. K. prevent one single person from "ruining" the entire group's learning experience?

In all the stories above, these teachers have first handled problems with compassion and an intention to help. They've talked to students one on one, facilitated a relevant class discussion, offered suggestions, and consulted, sometimes with parents, other times with colleagues, to no avail. When problems remain unsolved in spite of a variety of attempted solutions, teachers' risk of burnout, discouragement, and resentment increases greatly. Spending an average of five to six hours per day, for 180 school days, in a classroom culture that is malfunctioning is very draining. Many resort to methods of control that they never thought they would use when entering the teaching profession and find themselves yelling in spite of their best intentions.

Can new discoveries in neurobiology shed light on some ways to engage classrooms in turning around toxic interactions? The good news is that, yes, cutting-edge findings in neurobiology, and their applications in classroom projects, can help teachers turn around these impossibly exhausting situations.

1. WHY KNOWING ABOUT THE BRAIN IS IMPORTANT

A lot has happened in our understanding and knowledge about the brain in the last 20 years because of two critical discoveries. First, the

invention of the fMRI¹ is now allowing us to see sequences of activation in people's brains when they are engaged in certain experiences, whether it is a math problem or an emotional state. Since brain cell activation is associated with an increased blood flow in certain areas of the brain, the fMRI offers the possibility of recording neural activity as people learn a task or go from one emotion to the next. This allows experimenters to observe, for example, what happens when complex forms of learning, or encoding, occur in the brain. As a result, we now better understand the key factors associated with students' complex development of social and emotional experiences and what may help them engage in skills at critical times. Knowing some of these findings allows busy adults, for example, to be more effective in finding quicker solutions to classroom or group problems.

The second discovery is that the brain's ability to change structurally, also called *neuroplasticity*, is far greater than it was believed to be 20 years ago. Experiences and certain forms of attention have been found to dramatically change the actual structures of people's brains and influence who people become in everyday life. This high level of neuroplasticity is

Understanding the brain allows busy adults to be more effective in finding quicker solutions and having the problem-reducing effect they intend.

especially significant in the developing brains of children. It means that every choice students make, and every event they live, shapes in small, incremental ways the likelihood of them saying, doing, or feeling that same experience again.

The implications of these findings are that experiences we provide to students, and their level of attention to certain issues, dramatically shapes their actual brains and access to thinking, behaving, and feeling in competent ways. In other words, any adult involved with children, either a significant amount of time or in emotional interactions, is "co-programming" biologically children's likelihood of engaging in a behavior or not. Knowing how children's brains develop and process information increases the likelihood that we will have the problem-reducing effect we intend to have as opposed to inadvertently increasing it.

I will now review some of key concepts in neuroscience and interpersonal biology, which can dramatically increase educators' and counselors' effectiveness in handling children's struggles. It is beyond the scope of this book to provide a thorough overview of neuroscience. The focus here will be mainly on scientific facts, which are critical to know when assisting children develop social and emotional skills. The areas reviewed are neural networks, emotions, memory, attention, and mirror neurons.

¹fMRI stands for functional Magnetic Resonance Imaging.

2. MUST-KNOW CONCEPTS IN NEUROBIOLOGY FOR BUSY READERS

Neural Networks

Children are born with billions of brain cells, as many as there are stars in the sky, called *neurons*. Each brain cell is capable of having more than 10,000 connections (synapses) with others and forms complex neural networks (Restak, 2006). These connections determine sequences of thoughts, emotions, behaviors, and responses. For example, if the brain cells associated with the idea of going to school have often been connected with the brain cells associated with a reaction of fear, then these cells have a greater likelihood of being co-activated together. Each co-activation of these experiences makes their connection increasingly strong on a physiological level and more easily triggered in the future. This concept can easily be remembered by the now-classic statement of Donald Hebb (1949): “Neurons that fire together, wire together.”

What few people know is that, during childhood, the number of brain cells and density of neural connections increase greatly until seven to nine years old, when children’s brains are bubbling with a great number of thoughts and nonlinear ideas. When a child of that age solves a problem, his or her mind metaphorically needs to go through a labyrinth of interconnected thoughts and find him- or herself at the end of a path that may be near or far from a constructive solution (see Figure 1.1a). After that period, connections can still be made, but the brain becomes mostly involved in pruning seldom-used networks as illustrated in Figure 1.1b. Ironically, the increase in organized, linear thoughts and analytical abilities is actually related to a loss of synaptic density as the brain gets rid of unused connections to become faster and more effective.

This means that adults are not only laying the neural foundations for children’s mental associations in a number of areas (trust, confidence, self-worth, etc.) but also contributing to which of the existing neural networks will remain programmed in the brain and which will be pruned. For example, if a child doesn’t use his or her piano skills after that age, the brain will literally get rid of that network.

Young children’s brains are simply waiting for connections to be made and strengthened (Siegel, 2012). The more neural connections that are created around helpful sequences of responses, which fit with their unique brains, the greater the likelihood that children will be able to physiologically access and use helpful behaviors. The now-classic study asking kindergartners if they’d prefer to have one cookie

If children’s brains are slower to process complex information and emotional responses arise very quickly, how can we best support children’s development of impulse control?

Figure 1.1 Neural Connections at Different Ages

Figure 1.1a Because of the changing synaptic density in the neocortex, children’s ability to solve a problem can be experienced as finding their way in a “mental labyrinth.” Newborn babies cannot mentally solve a problem, seven- to nine-year-olds can be overwhelmed by a jumble of thoughts, and adolescents have faster, better-organized but more linear and habitual ways of thinking.

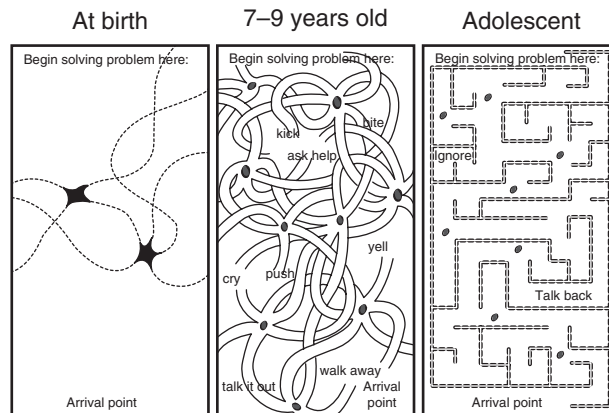
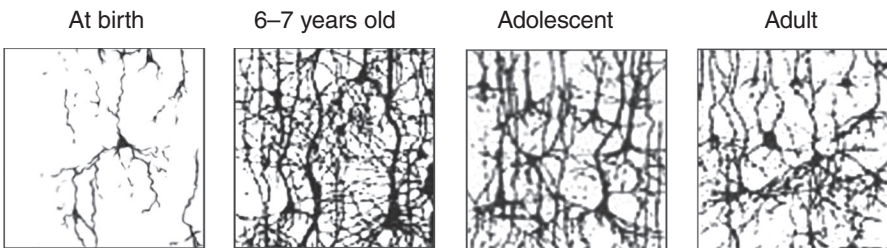


Figure 1.1b



Illustrations by Tri Tran.

now or two cookies in 15 minutes is a good example of this issue. Most children of that age have the intention to get the two cookies and are willing to wait, but after a few minutes, they can no longer stand it and come back, resigning themselves to have only one. What if, in young groups such as Tina’s class, we would further develop those neural networks, which already exist, and allow children to wait five minutes instead of teaching our adult way of controlling our adults’ brains? Using the existing neural foundation would magnify the effectiveness of their helpfulness.

Children undergo different developmental periods affecting their self-awareness, regulation of emotions, sense of self, and relationships with others. At each of these critical periods, educators and counselors can offer

activities, which will enhance and maximize children's complex wiring of emerging skills. With young children, this becomes a process of expanding the synaptic connections they are making and strengthening their random, successful problem solving. With middle-childhood students, this involves a process of strengthening multiple aspects of self as a worthy, productive, capable, and likeable student. With older students who have neurological access to more complex reasoning strategies, educators may want to enrich the increasingly organized thought-processing activities and empower students to competently solve most relational triggers with less emotional upset. Developmentally appropriate activities need to simplify problem solving for younger kids while offering more interesting and thought-provoking themes for older and more easily bored students.

Emotions

In recent years, emotions have been found to direct the flow of activation in the brain, shaping what is perceived, interpreted, responded to, and remembered (LeDoux, 1996; Damasio, 1999). Of significance to educators and counselors is that intense, negative emotions² have

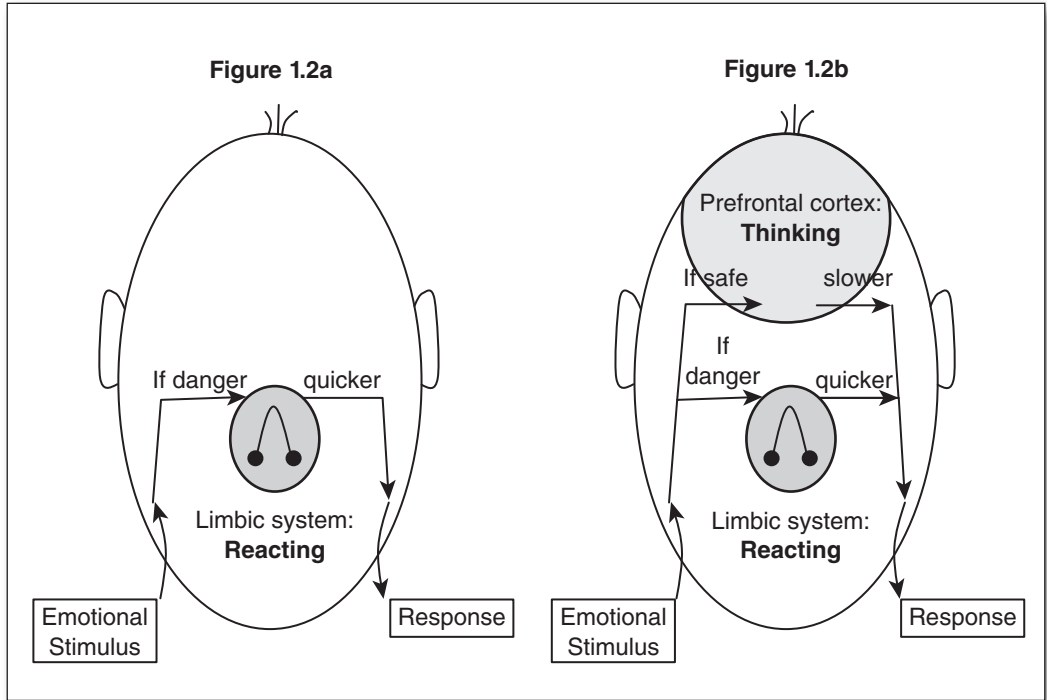
been found to be associated with reduced blood flow to the frontal cortex (the thinking part of the brain) and a reduced ability to connect with others. More specifically, under stress, the brain tends to send most of its resources (blood, oxygen, etc.) to the fight, flight, or freeze sections of the brain located in the limbic system and narrow its attention on the arousing detail (Siegel, 1999).

As is illustrated in Figure 1.2a and 1.2b, when an experience triggers a more- or less-intense negative emotion, the brain will increase blood flow to the quick response area of the brain, the *limbic area*, for a reaction. When an experience is not threatening, the brain will direct blood flow in the thinking part of the brain, the *prefrontal cortex*, for a more thought-through response. The reaction tends to be more impulsive, problem based, and focused on self-defense, while in contrast, the response can draw on relevant memories, intellectual lessons, values, and the person's preferences. If the trigger is not too intense, and there is enough time, the prefrontal cortex and, in particular, the cingulate gyrus will modulate and control the limbic area's reaction (Sousa, 2009).

Since new research has shown that intense emotions have a stronger hold on the brain than thoughts, how can we help children develop better impulse control during emotional events?

²All emotions can be helpful in a given context. For example, anger can be very positive in helping you defend yourself in a life-threatening situation. Brain studies, however, have shown that markedly different areas of the brain are activated for *positive* and *negative* emotions, which has led to the common use of this dichotomous language. Given the lack of better words, this book will follow this trend with an invitation to keep in mind the relative usefulness of all experiences.

Figure 1.2 Information is processed differently in the brain when a situation is perceived as unsafe.



Illustrations by Tri Tran.

The implications of this physiological process are very important: In general, the more upset children are, the less they have access to their frontal lobe analytical thinking abilities.

Three major ramifications arise from current neuroscientific studies of emotions. First, since emotions direct the flow of information processing in the brain, the process and the content of any important conversations with students benefits greatly from being anchored in emotional material. Most importantly, for complex thinking to occur effectively, these conversations benefit from an association with positive rather than negative emotions (Beaudoin, 2012). While it is often tempting for adults to lecture, teach, threaten, or punish children for socio-emotional issues, these methods are significantly less likely to yield any meaningful learning compared to interactions bathing in comfortable emotions.

More specifically, reasoning conversations alone are often not very effective as they activate the prefrontal cortex lateral (PFC-L), which is an

indirect route to the emotional brain, or *limbic system* (Siegel, 2007). Logical conversations, written contracts, agreements, and explanations about appropriate behaviors may be somewhat usable for students who are generally able to regulate their emotions but not for students who experience intense, explosive, or reactive negative emotions. When the brain is captured by negative emotions, great logical conversations are physiologically completely out of the processing loop. This is illustrated in Figure 1.3, where the teacher’s words of wisdom are stored in the reasoning area of the brain, which is metaphorically represented by a collection of books called “should,” while the actual self-control area of the brain is represented by a firetruck. In other words, during intense negative emotions, the intellectual knowledge area of the brain is not directly connected to the emotional area of the brain, represented by the explosive. Accumulating intellectual lessons on what should be done during intense negative experiences is therefore not the most effective way of helping emotional regulation in children who struggle the most.

When an adult gives a severe punishment, children will typically remember that this person is mean (the very simple association between pain and its trigger). However, they often quickly forget what they actually did and the adult’s intended lesson (the more complex connections).

Figure 1.3 Adults’ intellectual lessons tend to be stored in an area of the brain that is not directly involved when intense emotional reactions are triggered.



Illustration by Emily Phan.

Many adults can recall harsh punishments from their childhoods but not necessarily what they did to “deserve” them or what they learned. I am reminded of a second grader who was intensely despaired when he was told he couldn’t attend a classroom party as a consequence of his problem behavior. The child completely fell apart emotionally and had to be sent to the principal’s office. Once there, his negative emotions were inadvertently escalated when he was told his parents would be called, which added another layer of frightening consequences and led the child to become out of control and the staff to request police intervention. The teacher’s initial intent was for the child to stop lying. The effects were that the child was traumatized by the sequence of events, experienced a neural activation for personal powerlessness and despair, hated his teacher for the rest of the year, and was less willing to make efforts for her. She, and a number of other students, also started to distrust the child and had some fears about his potential behaviors for a long time. There was a great discrepancy between the teacher’s intentions and the effects of her decision because intense negative emotions were triggered. In such situations, children do learn something but usually not what is intended. Often, they learn to hate the adult associated with the intense, unpleasant experience. This is illustrated in Figure 1.4, where an educator giving a consequence,

Figure 1.4 Adults’ well-intentioned attempts at teaching children to think by giving increasingly severe consequences can overwhelm them with an additional layer of intensity when they are already struggling emotionally.

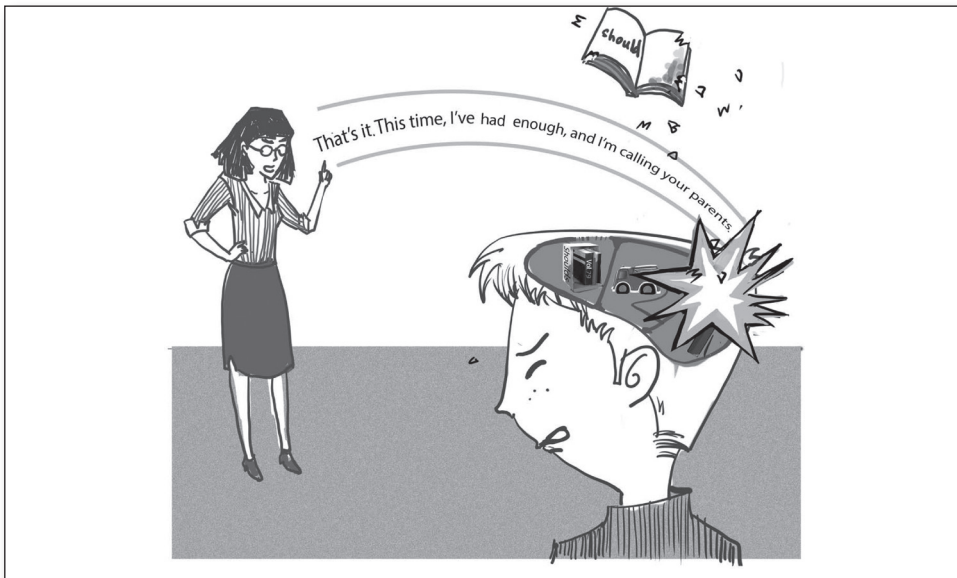


Illustration by Emily Phan.

which is experienced as intensely negative, mainly overwhelms the child's emotional brain without reinforcing the skills in the self-control area.

In sum, when it comes to enhancing complex social and emotional skills, neither reasoning nor severe consequences may accomplish the desired task. The first approach may only activate the PFC-L, which is not included during intense emotional reactions. The second approach is negative emotion based and may mostly activate the limbic system—fight, flight, or freeze.

In contrast, comfortable emotion-based conversations, if meaningful, activate the prefrontal cortex medial area of the brain and the anterior cingulate, which has a direct impact in regulating the limbic system and controlling reactions. Scientific research using brain-imaging techniques have shown that the anterior cingulate (represented by the firetruck in the figures) is highly involved in reining and tempering the limbic area's activation when a person is attempting to solve a relational problem and manage negative emotions (Bush, Luu, & Posner, 2000). Educators and counselors can therefore more significantly enhance emerging skills by creating a context in which these areas of the brain repetitively and meaningfully review successful solving of relational issues.

The second implication is that the naming of an emotional experience is in itself very powerful: "To name it is to tame it" (Siegel, 2007). Labeling is believed to provide an increased perspective and possibilities of higher cortical integration. In our current generation of children, often raised more by television and video games than by interactions with caring adults, the great majority of students in our projects have often exhibited a narrowed vocabulary to label their own emotional experiences. If their experiences are unlabeled, it is very difficult for these students to even begin to understand their own internal worlds yet alone make conscious decisions, solve emotional hardships, or understand someone else. The children exiting our projects often express some fascination for their newfound abilities to understand themselves better and navigate social dilemmas more effectively. Allow me to take an extreme example with kindergartners to illustrate this point more clearly: Max is interacting with his friend Noah, and he suddenly feels something unpleasant inside of him. If he doesn't quite know what it is (Fear? Anger? Sadness?), he is left to simply react impulsively in a rejecting way toward his friend, the most visible potential source of discomfort. If Max is able to realize that he is frustrated because Noah shared his Mom's refusal to have a playdate just now, he can realize Noah has nothing to do with this and is more likely to let go or, at the very least, respond to Noah differently.

Third, learning is much more likely to occur if we foster mental activity in positive emotional experiences. Since each child, at any given age, is constantly changing due to his developing brain and expansion of life experience, adults can create a context where children move more swiftly from known, well-practiced skills to what is possible for them to know and master, a concept popularized by the late Vygotsky (Berger, 2009). This movement, according to Vygotsky, is best accomplished through supportive

interactions with adults who provide guidance and experiential bridges, so the child can realize his or her full potential. Working at the intersection of what is known and what is possible to know involves extracting the experiential descriptions of moments when children almost engaged in problem behaviors but haven't. This process has been extensively described in another book (Beaudoin, 2012) and has many applications in groups.

Engaging in such a process reinforces the neural networks for emotional regulations that are preexisting in the brain but can benefit from being strengthened. For example, a child may become frustrated four times out of five when he or she is caught at a tag game. This experience may stand outside of the window of tolerance¹ but close to the rim, therefore being within reach of what is possible to know. If the educator is able to focus on the skills involved during the successful one-out-of-five moment (when he or she graciously accepted to be tagged), the child may become more knowledgeable on how to replicate this satisfying experience and better handle the game three times out of five the following week. If an adult again spends some time articulating, naming, and exploring the skills involved in the second week's performance of skills, the child may become better able to handle the game four times out of five the following week. Eventually, an event, which would have in the past triggered a large amount of negative emotions, progressively becomes handled skillfully most of the time and triggers only a manageable amount of frustration. The repetition of this articulating and strengthening of skills at the border of the window of tolerance progressively increases students' comfort in that zone, which results in the performance of skills within the "possible to know." This is also illustrated by the cartoon in Figure 1.5, where an educator helps a child who typically struggles with impulsive behaviors when his team loses by noticing moments of successful self-control and helping the child understand his own emerging skills. Without this attention, the skill of self-control becomes like a treasure one stumbles into during the night, which is wonderful at that moment but will be hard to relocate later on. If a helpful person shines a flashlight on the treasure (the skill), its context (when, where), and how to find it (inside oneself), it may be easier to "go back there." Many participants of our classroom projects have reported becoming more keenly aware of their own competent selves and the various skills they use to self-regulate in dire situations.

Finally, if the problem habit has intense emotions and personal meaning attached to it, the solution must have an equally compelling positive emotion and personal meaning attached to it for the brain to perform it (Beaudoin & Zimmerman, 2011). While it may be tempting to follow the cultural habit of dwelling on negatively loaded experiences, it is imperative that educators create a context for positive experiences to be equally noticed, analyzed, revisited, and thoroughly felt in the hearts of our young people.

¹The window of tolerance (Siegel, 2010a) refers to the range of arousal one's brain can handle without becoming dysregulated.

Figure 1.5 Children’s problem solving and impulse control skills can be enhanced when helping them notice and articulate, in a brain activating way, their mental processes about the situations they handled well.

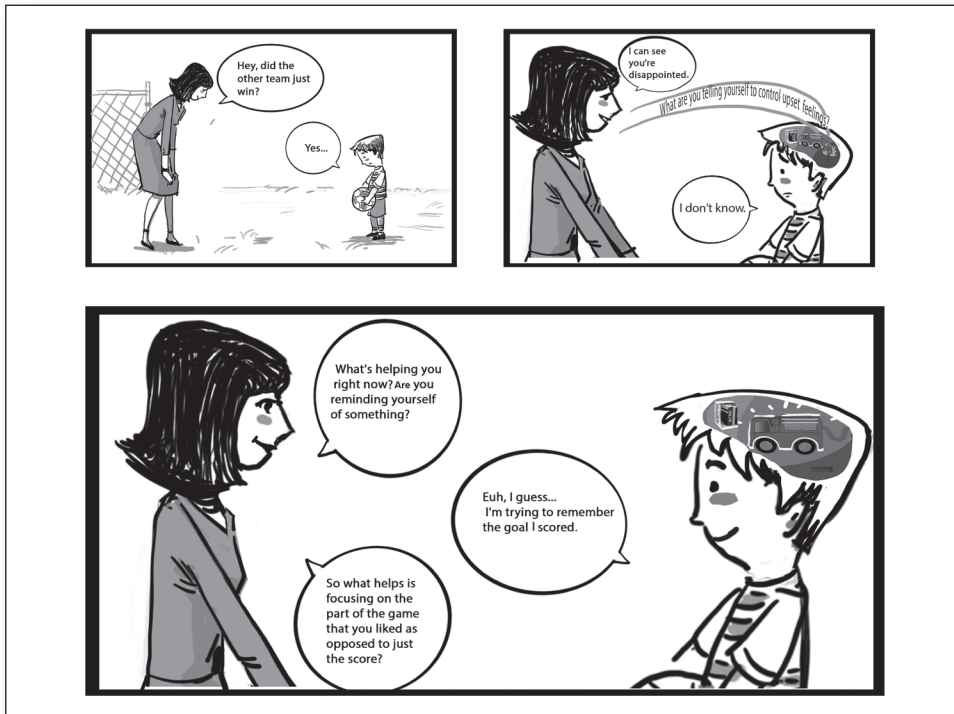


Illustration by Emily Phan.

Memory

Most educators rely heavily on the use of student memories with very little knowledge of what memory actually is on a biological level and how it functions. Memory is the mental capacity to encode, store, and retrieve information such as knowledge and lived experience. Memories are the reactivation of the most significant neural networks that co-fired during an event (Doidge, 2007). They do not reflect a “truth” about an experience but rather a neural recombining of different pieces of information. In other words, memories cannot be understood as the retrieval of a videotaped episode of students’ lives but rather as the reconstruction of a puzzle using the pieces that can be found in the brain. As such, some pieces of the puzzle may have been poorly connected to the original images and may go missing, while other pieces of the puzzle are central to the image and overly given attention. Moreover, each revisiting of the memory involves a reconstruction of the puzzle infused with the present time occurrence, which may change the original memory depending on the focus and the reaction of the listener.

In this reconstructive process, memories tend to be colored by the present appraisal of the event. Interestingly, if the new recollection of an event contradicts information shared at an earlier date, people will state that the new version is the more accurate one. This is true of adults and children as demonstrated by the well-known longitudinal study of people's recollection of 9/11 (Talarico & Rubin, 2003; Levine & Safer, 2002). People interviewed one and three years later often shared different accounts of their experiences than what they shared immediately after the catastrophic event, and when confronted with this difference, they stated that the new story was the more accurate one. This study well illustrates how the biological organ of memory is always changing the quality of our memories and infusing them with revisions and present-time experiences. This occurs with children who may be overly scared by the threat of punishment and reconstruct different stories of events in their minds and eventually become deeply convinced of their reconstructions. It can also occur in a class like Mrs. Keller's, where the girls' habit of reconstructing events in way that portrays others as being mean becomes so deeply ingrained that no other interpretation seems possible, leaving them responding to everything with tears.

Another interesting fact about memories is that they are stored and processed in what is often called the *emotional brain* (limbic area).

How can adults assist children in better encoding, and consequently more easily retrieving, their best problem-solving attitudes and skills?

Neurotransmitters and hormones, such as cortisol, produced during emotional experiences tend to fix emotional memories in structures such as the hippocampus, which plays a critical role in the long-term encoding and storage of experiences.

Given this complex link between

memories and emotions, people are more likely to encode experiences that involve emotions, such as meaningful and personally relevant experiences (LeDoux, 1996). Emotions have such a powerful role in the organization of memories that, when people are in a specific emotional state such as anger, for example, they have an increased likelihood of remembering other moments associated with that same brain state (mood congruent recall). In schools, this means that, when a child is angry at another student, he or she is likely to experience the bubbling up of past memories of frustrating interactions with the same person, which present and past added together, can add up to very intense and difficult-to-manage emotional experiences. This is often verbalized by students saying, "He always does that. I hate him." Most people can recall a lived experience of this process when remembering the last time they were angry at a partner or family member; memories of past frustrations easily fueled the present conflict. A difference between children's and adults' experience of mood-congruent recall, however, is adults' easier ability to draw the line between the emotional valence tied to each event, the distinction between past and present, and their ability to exert frontal cortex influence over controlling its expression.

Memories of positive experiences can also trigger mood-congruent recall if they are intense enough. Unfortunately, our brains and our culture do not tend to encourage this process very often. Conscious efforts need to be made for these links to take place more readily and for words to be superimposed on the experiences of competency. When positive experiences of our lives are left unarticulated, they are not included in our perception of ourselves or in the awareness of our abilities.

Since memories are always changing and do not go back in storage in the same way, what we choose to focus on in our conversations with students and what we highlight are of utmost importance. Children's memory malleability has been studied extensively with children witnessing crimes (Reeder, Martin, & Turner, 2010). In those extreme situations, rigorous protocols typically need to be followed to minimize biasing children's recollection of events. Few educators realize the profound impact of their words when discussing an event with a student. Rather than being an objective interviewer when asking about an event, adults are often unknowingly coauthors. For example, a principal might angrily tell a boy: "As I came running on the field to stop the fight, I saw you smile a little when you punched him." Such a sentence, whether accurate or not, inadvertently shapes the student's memory of the event and may leave him wondering if maybe he does like bullying after all. This comment on the event is interpretative and possibly incorrect. Once spoken, however, it may shape the student's experience of himself, especially if this student has little self-awareness and some confusion around his emotions and identity. A more helpful observation would be to comment on the student's hesitation before giving his last punch, and wonder if a part of him wanted to stop this fighting, or if he had suddenly noticed the tears on the other student's face. This information would be more helpful to encode in his memory of the event and set the stage for an important conversation about a potential desire to stop fighting in the future. Educators witnessing problem events have important roles in shaping the encoding of children memories and increasing their awareness of such events. Educators who do not witness problem events are urged to pay careful attention to the questions they ask and assumptions underlying their comments.

In sum, reviewing effective problem solving allows students to remember their own strategies and progressively reduce the frequency and intensity of problems. The more skilled students are at solving their own social and emotional problems, the less demands on the educator there are and the more time for academia, which is becoming of critical importance given the fields' increasing curriculums.

Attention

Attention is the act of noticing, observing, considering, concentrating, and keeping one's mind closely on something. Paying attention has a direct influence on whether you will remember an experience or not. For

Since attention to a skill directly influence the likelihood that it can be remembered and repeated, how can adults help children notice their best problem solving during the busy days of teaching large groups?

example, you might remember the clothes you wore yesterday because you paid attention to dressing up, but you might not remember how many times you sneezed. Similarly children will remember waiting for the tire swing to be available because they're paying attention to the unpleasant experience of waiting, but they may not notice their own flexibility when the student on the swing didn't want to come off and they spontaneously decided to go play another game. For an equal intensity, it could be said that the moderately unpleasant experience will be noticed and encoded more readily in the brain than the moderately pleasant experience. The brain has been found to have a tendency toward privileging negative encoding, assumed to be important for survival, over positive encoding. This means that we have to make some efforts for our brains to notice, observe, take in, and process valuable events for them to be experienced fully and for the strategies developed in one situation to be reusable in another. In the tire swing example, the lack of attention to the expression of flexibility leaves it unnoticed and therefore unlikely to be reused in a conscious way. When we pay attention to and are more conscious of our skills, we can choose to use them more. For example, when a student has mindfully experienced and articulated exactly what it feels like to be in a relaxed state, he or she can more readily access those bodily sensations and slip into the experience of calm when feeling agitated (Beaudoin & Zimmerman, 2011).

Mirror Neurons

Mirror neurons were discovered inadvertently as experimenters were observing the neural firing in the prefrontal cortex of macaque monkeys during grasping tasks (Iacoboni, 2009). The same cells would show activity whether the monkeys were grasping an object themselves or witnessing another engage in the movement. This led to the revolutionary discovery

Mirror neurons act as an internal program, which allows us to live and predict others' experiences and intentions. Since these predictions are shaped by life experience, how can adults help children who have developed a skewed interpretation program that portrays others as trying to be mean?

that mirror neurons constitute an internal program to experience firsthand, mimic internally, predict, and interpret others' actions.

Since mirror neuron's activities are entirely based on a person's prior experiences, this discovery has important implications in children's education. If a child endured physical abuse at home, and is with an educator who raises her or his

hand quickly to get someone's attention, the child's mirror neuron system may internally predict a blow, which in turn will trigger intense emotions and the reflex to move to avoid being hit.

Students can also internalize the emotional state of their peers and teacher within 300 milliseconds. Mirror neurons are activated very quickly, often bypassing slower intellectual reasoning to privilege past-lived experience. Adults are shaping children's brain wiring to predict others' behaviors and respond accordingly. As an educator, every single one of your responses, to students' emotions in particular, leaves an actual physiological trace in the brain of all witnessing students. If a child's brain was a computer, it could be said that adults are programming patterns of recognition, interpretation, and response to human interactions in lasting ways. This is a huge and enduring responsibility! It also means that educators and counselors will unavoidably face students whose mirror neuron systems have been shaped to predict others' intentions in unhelpful ways or minimally attend to others' experiences. This could be part of the issue in Marvalee's class, in which some children's mirror neuron systems may be less activated, leading to less empathy.³

People young and old can slowly improve their mirror neurons' patterns of prediction by living, noticing, and witnessing new interactions, which support constructive assumptions of intentions. This process stimulates children's burgeoning experiences of empathy and enhances its relevant neural activity.

SUMMARY

Recent research in neurobiology and brain development highlights the necessity of facilitating projects that do the following:

- Bathe in positive emotions, which direct the flow of information in the brain
- Connect important skills to be remembered with self-control areas of the brain
- Offer material that is very relevant to each student's unique lived experience
- Transform useful experiences into conscious, usable strategies that are easy to remember
- Provide tools for self-awareness and personalized labeling of emotional events
- Stimulate students' curiosity enough so that everyone pays attention to the project without pressures or rewards

³Research shows that people who experience more empathy have a greater activation of mirror neurons. However, many other factors can interfere with a person's experience of empathy and need to be taken into account when understanding relational problems.

- Create a context where students' mirror neurons are encouraged to notice other people's good intention, efforts, and kind gestures, leading to greater interpersonal tolerance and more peaceful choices
- Facilitate students' development of compassion and the skills to take care of one others' feelings, freeing the teacher and class time for academic material

Can Such a Project Really Exist?

It can if we thoughtfully question and revise the long-held assumptions we hold about students' skills and how to best support emerging neural networks. In the next two chapters, I will raise questions about commonly held beliefs regarding students' socio-emotional skills and invite readers to consider the different ramifications of such new perspectives on many areas of child development. Once we agree on the value of this shift in perspective, the classroom projects described in Sections 2 and 3 of this book become exciting adventures completely in line with the recent findings in neurobiology and developmental research.