Motivated Brain

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Chapter 1. The Challenge of Motivating Students

Engagement and motivation—what's the difference? Teachers everywhere strive to motivate their students and engage them in learning. Can we really motivate others, or is it a personal thing that happens when conditions are right? The English words *motivation* and *movement* are derived from the Latin *movere*, "to move." The German philosopher Schopenhauer (1999) suggested that motivation was the result of all organisms being in a position to "choose, seize and even seek out satisfaction." Neo-behaviorists Hull and Spence used terms such as *drive* and *incentive* as synonyms for motivational concepts.

Paul Thomas Young (1961) defined motivation as the process of generating actions, sustaining them, and regulating the activity.

Salamone (2010) suggests that motivation processes allow organisms to regulate their internal and external environment, seeking access to some stimuli and avoiding others. Sutherland and Oswald (2005) suggest that engagement is not just a simple reaction of a student to a teacher's action but is much more complex.

Although there are many definitions of motivation, with some stressing the notion of movement that would suggest engagement, we should not assume that motivation and engagement are synonymous. Sometimes the terms are used interchangeably, but really *motivation is the force or energy that results in engagement.* In a classroom, the complex interaction of teacher, student, and curriculum helps to create motivation that yields high engagement.

Motivation, Drive, Tenacity, and Grit

Motivation, drive, tenacity, and grit are currently hot topics. A variety of opinions and theories are emerging from cognitive psychology about how important these skills are to one's success in life and how to promote them.

Self-Efficacy

Students arrive at school with an already well-developed self-image of competence or incompetence resulting from messages they have received at home since birth. Whether they have been encouraged to persevere when faced with challenges or coddled and discouraged from taking risks to overcome obstacles, students' beliefs about their abilities will affect their level of motivation and engagement. A learner's self-efficacy (one's belief in one's ability to succeed in specific situations) can greatly influence his or her motivation. In general, students with high self-efficacy are more likely to give more effort to complete a task and to persist longer than a student with low self-efficacy (Bandura, 1986). Their world-view of "never give up" and can-do attitude are essential to success. Social beliefs related to gender or race also contribute to one's mindset about performance level. Gender bias messages or cultural cues may influence whether students feel capable or possibly

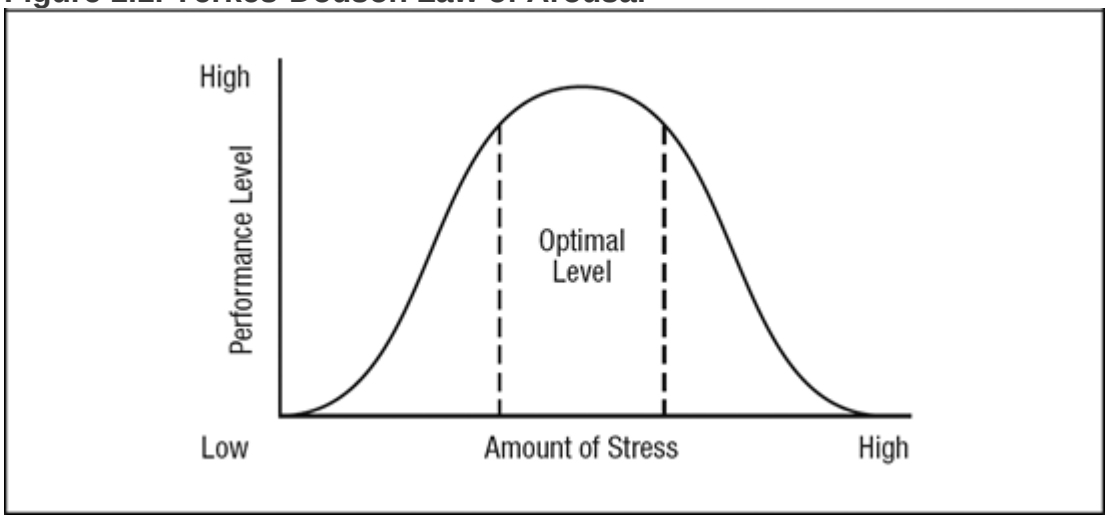
doomed to failure (Aronson & Steele, 2005). These beliefs can be instrumental in helping to motivate discouraged learners.

The Yerkes-Dodson Law of Arousal

Each of us reacts to a stimulus differently. For example, a project or task offered to a group of students will prompt a full range of responses related to motivation, from excitement to boredom. Students will react negatively or positively depending on how they perceive the difficulty of the task or the challenge involved and the interests they have. Their mindsets as to the probability of success will influence their excitement or frustration facing the task and thus, ultimately, their motivation.

The relationship between pressure (arousal) and one's performance is known as the Yerkes-Dodson law (Yerkes & Dodson, 2007). See Figure 1.1. As stress and pressure rise, performance usually improves. At the peak of the curve, one has reached "maximum cognitive efficiency" (Damasio, 2003). One's performance will not likely improve no matter how much additional pressure or stress is exerted. In fact, performance and motivation may begin to diminish if pressure continues. We can benefit from the endorphin rush that occurs when we increase our level of stimulation by pushing ourselves physically or mentally, but the apex of optimal performance is a tipping point. Like the Goldilocks theory, the Yerkes-Dodson law notes that in some cases there could be either too low or too intense an arousal. The ratio of stress to performance needs to be "just right" for each individual learner in order to maintain motivation.

Figure 1.1. Yerkes-Dodson Law of Arousal



We need to strive to provide the "just right" balance of excitement and challenge without undue stress for our students. Prior experience with similar tasks may influence one's reaction and degree of motivation. Tiered lessons and adjustable assignments (Gregory & Chapman, 2013) attempt to do this. So the trick is to find the optimum level of challenge that engages, and is enjoyable and safe for every learner (see the sections on flow and the zone of proximal development in Chapter 6).

Drive

In *Drive: The Surprising Truth About What Motivates Us*, Daniel Pink discusses research from the last 50 years on *intrinsic motivation*—motivation that comes from within ourselves. Carrot-and-stick enticements, or *extrinsic rewards*, not only don't work in the long run but may actually lower performance, stifle creativity, and decrease the desired behavior. We have an inherent tendency to seek out novelty and challenges, to extend and build our capacities, to explore, and to learn (Pink, 2009). Mostly people are motivated to do interesting work with supportive colleagues.

In his research, Pink found that people do not respond to monetary rewards and punishments as compared with being given the opportunity for:

- autonomy—people want to have control over their work;
- mastery—people want to get better at what they do; and
- purpose—people want to be part of something that is bigger than they are.

Grit

Another popular look at motivation includes research gathered by Angela Duckworth, a psychology professor at the University of Pennsylvania. She suggests that grit entails "working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity and plateaus in progress" (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). Duckworth and her colleagues define grit as "perseverance and passion for long-term goals," (p. 1087). Grit can be a positive indicator of success in the long haul. It adds the component of passion to the trait of persistence. The Intelligence Quotient (IQ) is not always the determining factor in student success, but grit can be, although it is not tied to intelligence. We need to rethink how hard and where we challenge students with unfamiliar and uncomfortable tasks. Many students with a high intelligence may decide to take the safe route and are not particularly successful in life, whereas students with average intelligence and a good level of grit often far surpass their high-ability peers as grit predicts success beyond talent.

Grit is not just having resilience to overcome adversity, bounce back from challenges, or survive at-risk environments. Grit is also staying the course, much like the Tortoise in the famed fable. The Tortoise persists even though his journey is slower and more tedious. The Tortoise wins the race because the Hare (a more talented runner) meanders and becomes distracted along the way. Grit is about being able to commit over time and remain loyal to goals that are set (Duckworth et al., 2007). Developing grit requires multiple rehearsals with content or skills to achieve success and develop mastery. We teachers must tap our creativity to provide the practice that diverse learners need, making sure to offer a variety of multisensory tasks that appeal to students' varied learning preferences. This practice blends the "art of teaching" based on what we know from the research base of impactful strategies, and the "science" of teaching (Hattie, 2009; Marzano, Pickering, & Pollock, 2001).

We must be careful not to come at grit from a fear-based focus on testing and college selection, especially with young adolescent brains that are more susceptible to negative or critical reactions.

Poorly informed teachers and parents may attribute a lack of success to a lack of grit without analyzing the full situation with regard to other issues, such as missing support or resources. Psychologists refer to this sort of misperception as "fundamental attribution error." In addition, perseverance that emphasizes punishments and rewards will undermine long-term grit. Grit is different from passion because grit requires effort and fully engaged commitment to be successful.

The Secret to Success Is Failure

In *How Children Succeed: Grit, Curiosity and the Hidden Power of Character*, Paul Tough (2012) makes significant contributions to Duckworth's notion of grit in regard to education. He postulates that in the real world, learning to react to failure is as critical to success as academic achievement. Noncognitive character traits such as resilience, persistence, drive, and delayed gratification are as important as cognitive skills (Farrington et al., 2012). If we don't learn how to deal with frustration and obstacles, we are not likely to choose challenging or risky paths and will perhaps lead a life of mediocrity and predictability. The trait of delaying gratification is necessary to persevere despite encountering obstacles.

Emotional Intelligence

Emotional intelligence (EI) is a person's ability to use her or his emotions mindfully. It consists of a balance between emotions and reasoning. Daniel Goleman (1995) believes that EI, like grit, is more important than IQ.

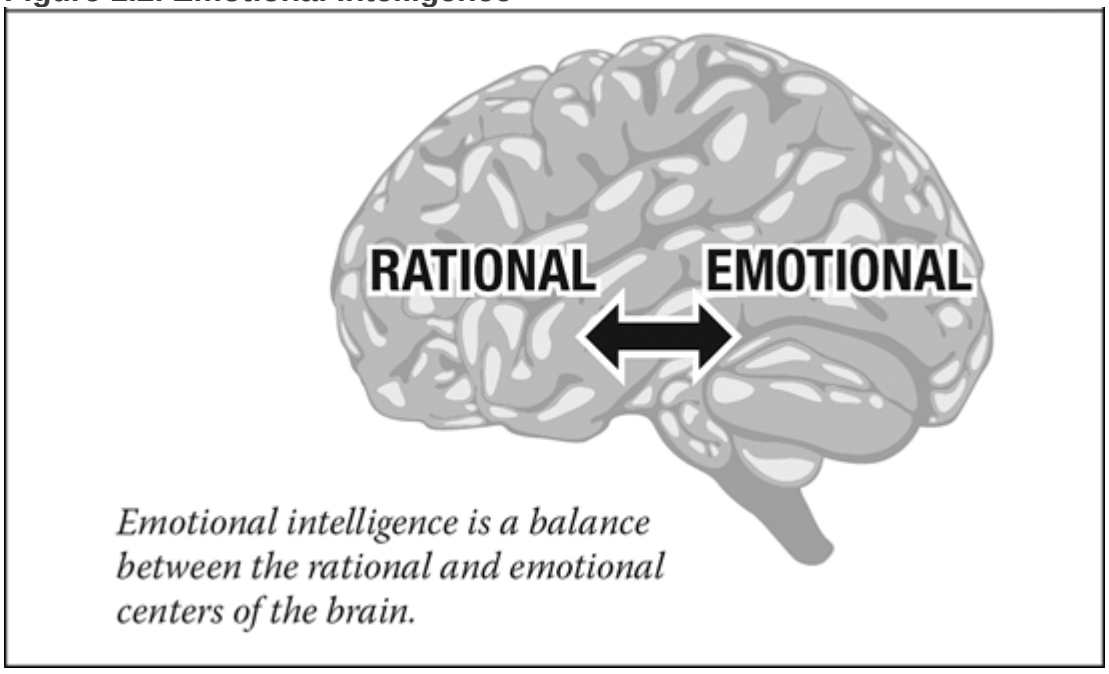
Goleman describes EI as composed of five emotional competencies, or domains: self-awareness, managing emotions, self-motivation, empathy, and social skills. He regards these domains as the keys to success in the 21st century.

- **Self-awareness.** This domain entails our ability to identify and name our feelings and to articulate our emotions. We can differentiate with precision a feeling and identify (beyond a basic feeling such as sadness) the more complex feelings of anxiety, upset, depression, or disappointment. We are not engulfed with the feelings and can name and then deal with them.
- **Managing emotions.** Once feelings are labeled, we can begin to think about how to handle them—how to soothe or change the mood or, if anger is the issue, how to resolve conflict.
- **Self-motivation.** If we can motivate ourselves, we can develop competencies such as setting goals, delaying gratification, and persisting. Being able to self-motivate is actually a state of mind—a certain level of mindfulness. Those who are self-motivated are often more successful in life, unrelated to their socioeconomic position and cognitive intelligence, because they have an inner drive and determination to persist.
- **Empathy.** Empathy is the ability to feel for someone else or to stand in another's shoes. Being able to read and understand the feelings of another builds tolerance.
- **Social skills.** People with good social skills have the ability to use interpersonal skills to interact appropriately with others. They are able to read and respond to people in a positive way. They are said to have "social polish." Their teamwork skills are refined, they are collaborative, and they have social influence.

Emotional intelligence derives from the communication between your emotional and rational "brains." Initially, primary senses enter the spinal cord and move through the limbic system (emotional center) to the frontal lobe of your brain before you can think rationally about your experience. In other words,

an emotional reaction occurs before our rational mind is activated. Emotional intelligence requires a balance between the rational and emotional centers of the brain (see Figure 1.2).

Figure 1.2. Emotional Intelligence



Plasticity is the term neuroscientists use to describe the brain's ability to grow and change. The change is incremental, but as we consciously practice new skills, permanent habits form. Using strategies to increase emotional intelligence allows the creation of billions of neural connections (dendritic growth) between the rational and emotional areas of the brain. A single cell can grow up to 15,000 connections (dendrites) with nearby neurons. We make new connections as we learn new skills, including emotional intelligence strategies. Practicing will strengthen those neural connections, and over time new behaviors will become habits.

Figure 1.3 lists the five domains of emotional intelligence and suggestions to foster this trait in students, with possible applications that may support the domain.

Figure 1.3. How to Foster Emotional Intelligence

Domains	How to Foster	Application
Self-awareness Ability to identify and name a feeling or emotion and how it might affect others.	Have discussions to help students differentiate emotions and label them.	Write in journals or logs. Share reflections.
Managing emotions	Help students identify feelings and discuss how they might best respond.	Take a deep breath. Count to 10. Take a walk.

Labeling feelings and responding accordingly; includes self-regulation.	Use "teachable moments" when situations happen.	Do something else. Create distractions.
Self-motivation Ability to set goals, persist, and delay gratification.	Help students develop strategies to persist and problem solve to continue to move forward.	Set goals. Brainstorm how to persist. Problem solve.
Empathy Ability to feel for another and understand his or her feelings.	Prompt students to think about others' feelings and feel "with them."	Model empathy. Discuss issues where feelings for others are identified and reflected on.
Social skills Ability to "read" another person, respond appropriately, and build rapport and common ground.	Explicitly teach social skills. Practice social skills when using group work.	Model skills. Suggest appropriate language.
Source: Adapted from Bradberry and Greaves (2009). This resource provides concrete, practical ways to increase one's emotional intelligence.		

Belief Through Effort

Fredricks (2014) suggests a view of engagement that considers behavioral, emotional, and cognitive engagement and their integration.

Behavioral engagement consists of such things as positive actions (e.g., compliance with classroom rules and school norms), nondisruptive behaviors (attendance and orderliness), effort and participation, and school community involvement (sports and clubs). Students who have behavioral engagement "play the school game" and it is easy to observe these students. Engagement here refers mainly to on-task behavior.

Emotional engagement entails students' emotional reactions to school, whether there is a feeling of belonging, and whether they value tasks and school. Emotionally engaged students are vested in school and connected to it. This type of engagement is often overlooked. The more interest, positive attitude, and task satisfaction (without anxiety, stress, and boredom), the greater the engagement.

Cognitive engagement refers to students' investment in tasks and challenges, as well as their perseverance in completing and tackling challenges. They are aware of what they are doing and why, both hands-on and "minds-on" for a specific strategy or task. Cognitive engagement also includes self-regulation, strategic planning, and reflection. It often is described as "deep" rather than "surface" learning.

Self-Determination Theory

Self-determination theory (SDT) suggests that we are driven by a desire to continually grow and reach fulfillment (Deci & Ryan, 1985). We are centrally concerned with how to move ourselves or others to act. We need to master challenges and experiences to develop our sense of self. Deci and Ryan recognize two basic reward systems, intrinsic and extrinsic. Intrinsic rewards tap into inner potential and interests, allowing us to express our true self and growth. Extrinsic rewards provide tangible rewards or incentives such as stickers, pizza parties, and bonuses. Deci and Ryan suggest that individuals tend to move toward the innate need to grow and gain fulfillment. We need to feel the following to satisfy and achieve psychological growth:

- Competence and mastery of skills
- Connections and relatedness and a sense of belonging
- Autonomy, or a sense of control over their goals and behavior

If we achieve these, we become self-determined and are intrinsically motivated to pursue what is meaningful to us. Being constantly tempted and enticed by rewards undermines the intrinsic motivation that already exists in each of us. *Motivational crowding out* is the term used to describe how external rewards (e.g., money, prizes, recognition) may crowd out intrinsic rewards of a job well done and enjoyed. Thus, the common classroom practice of rewarding students with stickers, privileges, and so forth, can backfire when it comes to long-term motivation.

Deci, Koestner, and Ryan (1999) also suggests that intermittent positive encouragement and feedback on performance can increase one's intrinsic motivation. Positive feedback makes us feel more competent and enhances personal growth. Deci and Ryan explain that the social environment has an impact on the growth. The environment can enhance or disrupt the growth of the human psyche. "Social environments can, according to this perspective, either facilitate and enable the growth and integration propensities with which the human psyche is endowed, or they can disrupt, forestall, and fragment these processes resulting in behaviors and inner experiences that represent the darker side of humanity" (Deci & Ryan, 1985, p. 6).

Punished by Rewards

Alfie Kohn (1999) talks about "punishment by reward" wherein we lose a sense of joy and accomplishment (i.e., intrinsic reward) because we are coerced into action by extrinsic rewards rather than spurred on by innate motivation. Kohn cautions that extrinsic rewards—"carrots"—may work in the short run but not in the long run; in fact, manipulating people with incentives may actually cause harm. He suggests these rewards only result in temporary obedience and do nothing to increase drive because most people lose interest in tasks that they are doing only for the reward. Rewards turn what should be satisfying tasks into drudgery. Often lower-quality work is the outcome. Kohn cites 70 studies showing that the incentives/rewards such as *A* s and pizza parties are not effective and can be counterproductive in the long term in regard to instilling a desire to learn and a strong work ethic in students. Praise is also not helpful, because it supports the idea of "fixed mindset" or intelligence (Dweck, 2006). More effective is corrective and supportive timely feedback and the encouragement for effort.

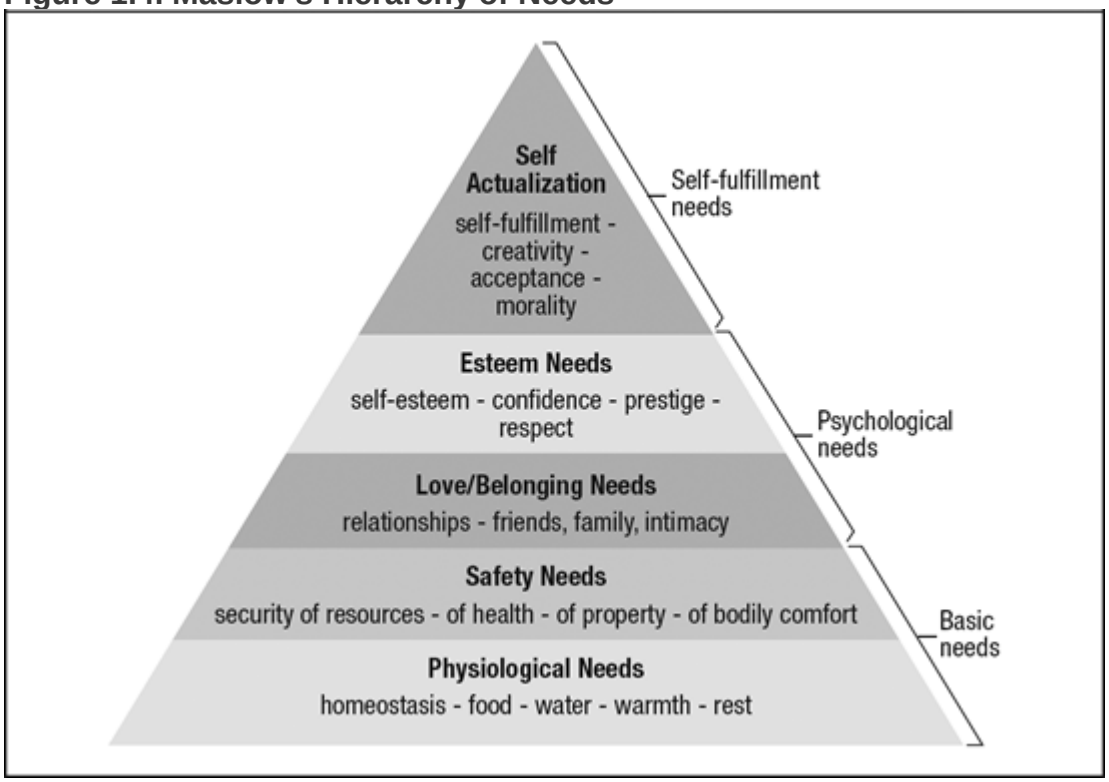
What if we got rid of grades and praise and focused on real learning? If the behavior needs to be manipulated to achieve compliance, perhaps something is wrong with the task. If learning is interesting, challenging, and meaningful, doing the work is its own reward. Students should not have to be coerced or manipulated to complete it.

Basic Needs and Choice Theory

The brain's original purpose was not to go to school but to survive and thrive. Several theorists have suggested which basic needs are most important to humans and suggest that these needs must be met in order to allow us to eventually focus on learning.

In 1968, psychologist Abraham Maslow proposed a hierarchy of human needs beginning with the most basic, as listed here (see also Figure 1.4). These needs must be met before we can move to self-actualization.

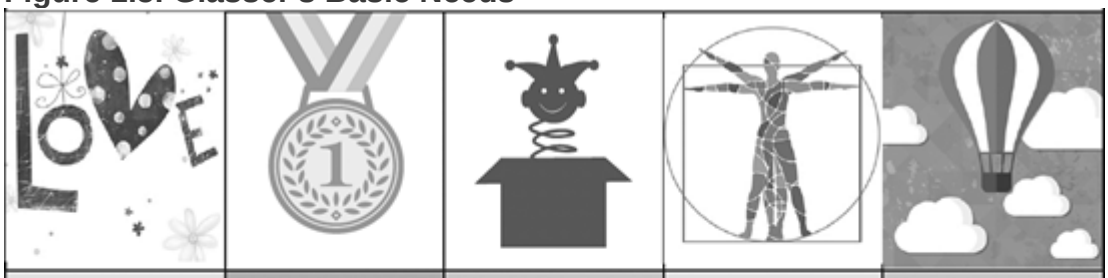
Figure 1.4. Maslow's Hierarchy of Needs



- Physiological needs: food, water, air, shelter
- Safety needs: security, order, freedom from fear
- Belongingness and love: friends, spouse, children, family
- Self-esteem: self-respect, achievement, reputation
- Self-actualization: becoming what the individual has the potential to become

Glasser's (1990, 1998) choice theory of motivation cites five important needs. These are similar to Maslow's needs in many ways, although they are not arranged hierarchically (see Figure 1.5). Glasser suggests that all we do is behave, and almost all behavior is chosen. His choice theory focuses on the growth of relationships and not external control.

Figure 1.5. Glasser's Basic Needs



Love & Belonging	Power	Fun	Survival	Freedom
• belonging • being loved • being respected • friendship • sharing • cooperation	• recognition • success • importance • achievement • skills	• enjoyment • laughter • learning • change	• health • relaxation • sexual activity • food • warmth	• choices • indepen-dence • freedom from • freedom to

The behaviors that we choose are a personal choice and are always within our own control. Glasser suggests that we are driven by genes and have the following needs:

- The need to survive and procreate
- The need to belong and love
- The need to have some power
- The need for freedom
- The need to have fun

Glasser believes the need to belong, which parallels Maslow's need for belongingness, is most important. If students feel disconnected and frustrated that their needs are not met, they will likely give up. A sense of not belonging is a major source of school failure (Glasser, 1998). Students need to feel that they belong and have some choices and a certain degree of personal control.

Choice theory focuses on seven caring habits that create conditions that draw people together and, conversely, seven deadly habits that push people apart and strain relationships.

Seven Caring Habits	Seven Deadly Habits
Supporting	Criticizing
Encouraging	Blaming
Listening	Complaining
Accepting Trusting	Nagging
Respecting	Threatening
Negotiating differences	Punishing
	Rewarding/Bribing to control

Choice theory also revolves around the following beliefs:

1. We can only control our behavior.
2. Information is all we can give someone else.
3. Most psychological problems are relationship problems.
4. Our past has everything to do with what we do today, but only our basic needs can be satisfied right now.
5. All behavior is made up of four elements: acting, thinking, feeling, and physiology.
6. We have direct control over acting and thinking, but we only control our feeling and physiology indirectly by how we choose to think and act.

Both Maslow's and Glasser's theories stress the notion of basic needs taking precedent over all else. As we think about motivating our students, we must recognize that their basic needs—as well as other needs such as feeling safe and belonging—must be met before they can focus on fulfilling higher-order needs such as learning and self-development.

Self-Efficacy

Another theory with implications for motivation is Bandura's (1986, 1997) theory of self-efficacy. His basic premise is that people will engage in activities if they believe that they are competent in them. Students will be more likely to engage, persist, and succeed at tasks when they feel a sense of efficacy. Failure may be due to a lack of skills or the efficacy to use them. Bandura identifies the following classroom practices that inhibit feelings of positive self-efficacy:

- Direct instruction where students can get lost in the progression
- Low-ability groupings
- Highly competitive practices where some learners can't possibly succeed

In contrast, Schunk (1989) suggests the following strategies to enhance students' self-efficacy:

- Setting attainable personal goals
- Modeling statements of self-efficacy
- Focusing on constructive feedback
- Encouraging learners to articulate and share strategies that work

Diminished Student Engagement and Motivation: Eight Possible Reasons

What is responsible for lack of motivation? Educators across the country, teaching all socioeconomic groups, are asking, "Why aren't these kids motivated?" As indicated by the theories just discussed, many factors can contribute to students' lack of motivation. Other possible reasons include the infusion of technology into students' lives, the expectation of immediate gratification, chronic stress, and living in impoverished conditions. These issues may not be in our locus of control.

But there are several school factors that we believe are contributing to low student motivation. These include lack of real-world application, apathy from students deriving from instructional mediocrity, social isolation (and bullying), and fixed mindsets. Fortunately, these are all aspects of education that we *can* do something about.

Technology

The digital natives coming to school today are very adept with and used to using technology that they are not allowed to experience in most classrooms. We sometimes have a skewed viewpoint when it comes to technology, blaming the distractibility of technology for students' lack of engagement and learning.

Indeed, if we do nothing more than replace textbooks and encyclopedias with Google or Bing, or use the computer or tablet for nothing but writing exercises, technology in the classroom is not as motivating as using these tools to SEEK, find, and use information for problem solving and creativity. Advanced engagement through higher-order thinking and production are preferable uses for technology over the pursuit of trivia or gaming.

Unfortunately, because of a lack of hardware and sometimes teacher confidence and creativity, students are denied access to the very strongest engagement resource we have—technology. As we discuss in the next chapter, dopamine releases when students have a chance to seek and explore using technology. Whether for research, inquiry, problem-based learning, remediation, or enrichment, many educators are missing the boat in terms of using technology to intrigue and engage learners.

Immediate Gratification

Some blame students' apathy or lack of engagement on the fact that learners today are a "now" generation: if they don't succeed on the first try, they give up. This learned behavior evolves from lack of persistence. When a student has had a series of failures or depends on others to help, that student may develop learned helplessness. Persistence can be frustrating as one struggles with issues or problems, which increases stress and the release of cortisol rather than dopamine, which in turn diminishes the commitment to a task. The cycle becomes one of "I try, I don't succeed; I feel bad, so I give up."

Apathy

Some students come to school at age 5 full of enthusiasm and excitement. For them, kindergarten and the elementary years introduce enough novelty, interesting tasks, and challenges to hold their attention. For other students, however, and in less inspiring classrooms, apathy can creep in. Direct instruction with little student interaction or project work, and problem solving under the guise of "covering the curriculum" to succeed on standardized tests are classroom practices that can foster apathy among our students. Some students "play the school game" and endure the monotony of day-to-day rote learning and lecture models, regarding education as their "job" and a means to an end **(**e.g., graduating, attending college, or finding a job**).** A large population of students can become bored and disengaged as the lessons are repetitive, lack relevance to their real world, and require only low-level thinking skills. Their passive receptivity to learning with a lack of emotional and cognitive engagement is perceived as apathy, when actually instructional mediocrity is at the root of the problem.

Lack of Relevance to the Real World

Many students believe that some of what is taught in school has no real meaning in the real world. Being told that this is "good to know" or "You might need this someday" is not necessarily engaging if you are only interested in the here and now. As educators, we need to be more overt and transparent as we connect student assignments to curriculum standards as well as real-world standards. Helping students see how writing a report, delivering opinions supported by evidence, and learning to collaborate, for example, are useful abilities in *any* professional role as well as in their personal life will let students see the curriculum's applicability to their lives. Offering students choices of problems and issues to address in math, science, and social studies that affect or will affect their world in the future can be more motivating than traditional textbook work.

Fixed Mindsets About One's Ability

Carol Dweck (2006) notes that some people develop a fixed notion of their intelligence, whereas others have a growth mindset. With a fixed mindset, we believe that we are born with a certain limited potential that blocks expansive thinking and fosters a lack of drive. On the other hand, a growth mindset involves the belief that with effort and persistence, we will improve, master tasks, and succeed. If students have come to believe in a fixed mindset, they feel there is no use trying. If they have endured seven or eight years of this approach, they can become passive, discouraged students who are not optimistic about the future and disengage so as not to fail.

Brooks and Goldstein (2008) say more effective teachers have a growth mindset that guides their behavior in the classroom. They convey a belief in the potential of all students through their words and modeling so that students in turn develop a growth mindset and become more willing to persevere despite setbacks.

Poverty

Depending on where you live there may be at least 20 percent of children who live in poverty. Based on 2010 census data:

- 22 percent of American children live in poverty
- 39 percent of black children live in poverty
- 35 percent of Hispanic children live in poverty

Children who have grown up in poverty have different brains for a variety of reasons: they may be malnourished resulting from a poor diet; they may have had fewer academic experiences and opportunities and so have limited prior knowledge in some subjects; their vocabulary, verbal skills, and language patterns may be limited. If they are second language learners and live in poverty, they have a double issue. They may perceive their social status as "less than" some peers, and their self-esteem may be low. Research shows that their IQ may be 30 to 40 percent lower than their peers (Griggs & Walker, 2008).

Social Isolation

Many students—not just those in poverty—do not feel comfortable in school. They don't find it a safe haven for body or mind, and thus their basic needs are not being met. They are isolated for many reasons. Students who are English language learners perhaps lack motivation to engage in conversation or just can't make sense of new concepts and therefore may develop learned helplessness. They may be illegal aliens or members of a migrant family who know that they are not going to be in their location for long and thus don't want to become attached to or involved in the school culture. For other students, sexual orientation may be an issue that prevents them from becoming engaged with others or with the academic content. Some students with different cultural backgrounds have a difficult time connecting to what is being taught and how it relates to their prior knowledge or skills. There is often little effort made by the teacher to connect to their culture and make a "bridge" for the learning. A high degree of racism or bullying may be present in school that emotionally hijacks students. They are too occupied with self-preservation (physical or psychological) to be concerned with learning. All these conditions mean that students' basic needs are not being met, and thus paying attention to what we think is important is not high on their list of priorities (National Research Council, 2003). These conditions also can create stress, the topic of the next section.

Students Under Stress and Perceived Threat

Stress, excessive pressure, and perceived threat can temporarily shut down enthusiastic motivation as our brains go into a default reflex response.

The brain contains a sensory screening process—basically a survival mechanism—whereby the brain scans the horizon for a potential threat. On the savannah, a threat might have been a wild predator. In modern classrooms, a variety of situations and circumstances may be perceived as threats and cause undue anxiety and stress: fear of ridicule or punishment, exclusion, being asked to keep seated and quiet, isolation from classmates, unclear expectations, or tasks that are too easy or too difficult.

The brain's survival mechanism to respond to perceived threats in the environment is the reticular activating system (RAS), a primitive network of cells in the lower brainstem that acts as the gatekeeper to what information flows into parts of the brain responsible for higher-order tasks, such as learning. Under normal conditions, the amygdala directs incoming data to the prefrontal cortex (PFC), where the information can be sent processed into long-term memory.

The amygdala, located deep in the temporal lobes, triggers the body and brain to react with the appropriate fight, flight, or freeze response to the crisis and releases of a high level of stress hormones. This *reflexive* response takes over, and the executive, *reflective* brain functions are temporarily bypassed. When there is unmanageable stress, self-preservation takes over, motivation is reduced, and learning is minimized.

Neuroimaging has provided information about which parts of the brain are engaged when a threat is present. Emotions such as fear, anger, or sadness interfere with learning as the activity in the brain remains in primitive areas instead of in the PFC. The RAS sends the sensory input to the lower areas of the brain. The brain does its original job in protecting the person from harm. The RAS directs the

threatening sensory input through the amygdala to the primitive brain where fight, flight, or freeze is the order of the day. The primitive brain is in control, and the real sensory input students need for learning isn't directed to the PFC (Raz & Buhle, 2006). If this stress persists, the amygdala is under constant stress and information is blocked from the PFC, as the brain can only focus on survival rather than the content or skills being taught. It's not that students are not paying attention. They are—but not necessarily to the things we want them to. The response to stress also may produce inappropriate behavioral responses when the brain is in the fight, flight, or freeze survival mode, with students often zoning out or acting out. Their reduced academic success affects their self-confidence and reinforces a fixed mindset and often learned helplessness.

Rather than threat, it is important that novelty, interesting ideas, and curiosity-arousing items—including music and colors—are present in the classroom to stimulate the RAS. Then the "door" to the PFC is open (Wang et al., 2005). Instructional elements like these can be particularly motivating and attention grabbing, allowing students to relax and enjoy learning with very low threat. This environment increases the possibility of "velcroing" information or concepts to the mind and transferring learning into long-term memory.