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27. Neuroscience of engagement and SCARF: why they matter to schools

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Introduction

More than fifty years ago Professor James B. Conant, former president of Harvard, wrote that the education system "works, most of us like it, and it appears to be as permanent a feature of our society as most of our political institutions" Conant (1959). In the years of debate over the efficacy of the education system that ultimately ensued, it is probably fairest to say that at least the latter part of his statement remains true. With regard to the former, within a decade of Professor Conant's optimistic assessment, demands for education improvement, reform, and change began to be raised (Holt 1969; Silberman 1970; Illich 1971). A variety of both government and nongovernment studies brought to light system shortcomings in fundamental skill mastery (particularly in the sciences), school-to-work relationships, dropout rates, teacher turnover, school leadership, and other ailments (Goldberg 1996; US National Commission 1983; Ravitch 2010). The situation confronting the education system, and the stakeholders it was intended to serve, was perhaps best expressed by Mr. Silberman, who at the time of his writing was an editor at *Fortune* magazine:

> It is not possible to spend any prolonged period visiting public school classrooms without being appalled by the mutilation visible everywhere—mutilation of spontaneity, of joy in learning, of pleasure in creating, of sense of self. The…schools…are the kind of institution one cannot really dislike until one gets to know them well. Because adults take the schools so much for granted, they fail to appreciate what grim, joyless places most…schools are, how oppressive and petty are the rules by which they are governed, how intellectually and aesthetically barren the atmosphere. (Silberman 1970, 10)

In the decades that followed, educational reform took on a variety of forms, all intended to bring about needed changes. These reforms can be categorized generally as calling for changes in content (Evans 2005; Goodson 1993), expectations (Weinstein 2004), time (Kneese 2009), teaching and assessment (Martin-Kniep and Picone-Zocchia 2009), and infrastructure (Adelman and Taylor 2007; Donaldson 2006). Virtually all Western governments responded by enacting legislation and creating commissions intent on reforming the educational process (Boyd-Barret and O'Malley 1995; Ibáñez-Martín and Jover 2010). Despite these well-intended efforts and with educational improvement and reform a continuing priority worldwide, the search for viable solutions continues today.

A more recently proposed solution showing considerable promise is the application of neuroscience to the educational environment (Sousa 2010). Over the past decade, significant advances in brain-imaging technology, most specifically in the use of the fMRI, have provided neuroscientists, social psychologists, and instructional theorists with significant new insights into the functioning of the brain (Ochsner and Lieberman 2001; Geary 2007). In fact, back in 1997 there were just ten such studies published; in 2007, there were nearly eight per day (Editorial 2008).

Taken together, and particularly in the case of driving change, this neuroscience and social-psychology research has the potential to significantly advance our understanding of how school leaders can improve the quality of their areas of responsibility—improving both student and teacher productivity, creativity, and ability to solve problems. Despite its relative youth, neuroscience research and the tools it suggests have brought about considerable interest in neuroscience's applications to teaching (Jensen 2005), learning (Sousa 2005), the curriculum (Costa and Kallick 2009), and education science in general (Tokuhama-Espinosa 2010). Utilizing the lens of neuroscience, we look at the potential application of the Status, Certainty, Autonomy, Relatedness, and Fairness (SCARF®) model (Rock 2008; 2009) to the education system, specifically considering its ability to elevate the engagement level of the school learning and teacher working environments.

Notion of engagement in schools

In general, the term "engagement" refers to the degree to which a person is committed or dedicated to an organization or relationship (Rutledge 2005); Rock and Tang 2009). In the workplace, it refers to the degree of positive emotion employees attach to the organization, their job, and their colleagues. When people are engaged, they are attracted to, inspired by, committed to, and even fascinated by their work or their input to the relationship. Students are said to be "engaged" when they make a psychological investment in learning, are involved in their school and its activities, persist despite challenges and obstacles, and take visible pride in accomplishing learning objectives beyond grades (Newmann 1989; Newmann 1992; Gordon 2006). Student engagement in schools has been found to be one of the most robust predictors of student achievement (Guthrie, Schafer, and Huang 2001), regardless of the student's economic and social stature (Klem and Connell 2004).

In exploring the issue of the "engaged student," students fall into five main categories of engagement (see fig. 1):

- Actively disengaged: a high average threat state
- Disengaged: an average threat state
- Neutral: midway between threat and reward states
- Engaged: on average a reward state
- Deeply engaged: strong average reward state

Student engagement in schools has been found to be one of the most robust predictors of student achievement...

Students in the first category have the potential to undermine the learning environment. By contrast, an engaged student is positive for everyone—fellow students, teachers, administrators, and parents (Gordon 2006).

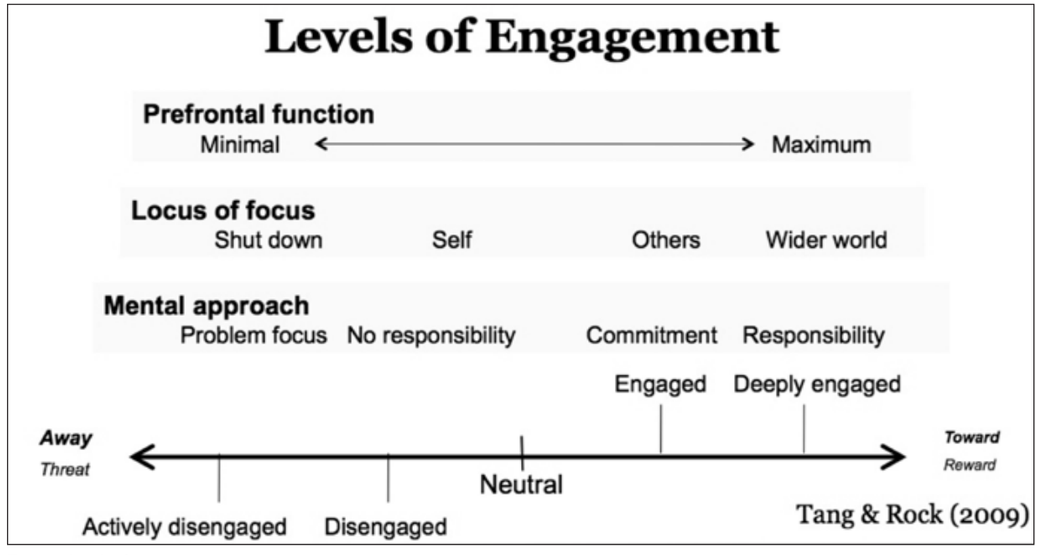

Figure 1. Levels of engagement

Figure 2. SCARF

Neuroscience of SCARF

The SCARF model is a summary of major findings in social, cognitive, and affective neurosciences that reflect a pattern in human behavior (Rock 2008; 2009). It includes five domains of human social experience that provide an organizing principle for the brain and its motivational circuitries. The brain considers these domains as important as "life and death," assessing them as either threatening or rewarding (Gordon 2000; Lieberman and Eisenberger 2008).

These five domains are *status* (Zink et al. 2008; Eisenberger and Lieberman 2003; Chiao, Bordeaux, and Ambady 2004), *certainty* (Hedden and Gabrieli 2006), *autonomy* (Donny, Bigelow, and Walsh 2006; Dworkin, Mirkis, and Smith 1995), *relatedness* (Cacioppo and Patrick 2008; Kosfeld et al. 2005; Mitchell, Macrae, and Banaji 2006), and *fairness* (Tabibnia, Satpute, and Lieberman 2008; Seymour, Singer, and Dolan 2007). As defined by Rock (2009): "Status is about relative importance to others. Certainty concerns our ability to predict the future. Autonomy provides a sense of control over events. Relatedness is a sense of safety with others, of friend rather than foe. And fairness is a perception of fair exchanges between people."

These domains activate either primary rewards, or primary threat circuitries of the brain. Reward states are associated with more cognitive resources (Arnsten 1998), more creativity (Friedman and Foster 2001), greater ability to solve problems with insight (Fredrickson 2001), and experiencing a wider perceptual field (Schmitz, De Rosa, and Anderson 2009). On the other hand, a threat state is associated with less creative thinking (Jung-Beeman, Collier, and Kounios 2009); mental fatigue (Tang and Posner 2009); and poor health and avoidance responses, such as sadness, anxiety, lack of safety, depression, and mind wandering (Rock and Tang 2009).

Self-regulation is a critical function of our brain and is central to our capacity to control our impulses, make strategic decisions, moderate our emotions, and pursue our goals (McDonald 2009; Diaz, Neal, and Amaya-Williams 1990). It enables us to set and adjust our goals and expectations as we face new events and situations (Paris, Byrnes, and Paris 2001). Self-regulation and motivation are intrinsically related. Motivating behavior is very much related to maximizing rewards and minimizing dangers as far as the brain is concerned. Since understanding the SCARF domains can increase our self-understanding and enhance our self-regulation, it may very well have an application for educators and students in schools.

SCARF in schools: an illustration

How might using SCARF increase students' ability to assume greater responsibility for their own learning? How might it help parents expand on their use of rewards for motivating their children? What role might SCARF play in the development and support of teachers' learning and work? Let's begin with a brief preview of how SCARF plays out in the world of schools from first the student perspective and then from that of teachers and administrators.

Self-regulation is a critical function of our brain and is central to our capacity to control our impulses, make strategic decisions, moderate our emotions, and pursue our goals.

SCARF elements and the student

Janira is a 12-year-old student in an urban middle school. She is an avid doodler in class. She is also prone to distractions and has a hard time sitting still during her teacher's lectures. She is articulate, opinionated, and passionate about lots of things, including art, music, animals, people, and culture, but has a difficult time connecting any of her interests with the actual classroom material provided by her teachers. Her disengagement reveals itself in constant acts of defiance, including talking back to her teachers and refusing to complete work, do homework, or finish tests. These acts have earned her a long-standing reputation of a rebel, if not a bully. In the past three months, she has gone to school detention ten times and has been suspended twice. Despite her parents' attempts to reason with her, or with the school, nothing has changed. Her parents mirror the school's punishments with curfews and loss of privileges, which Janira finds a way to defy on a regular basis. Janira feels increasingly alienated and disengaged. She has

befriended a small group of peers who no longer attend school and who do all kinds of drugs, and has become the leader of that group.

Janira experienced very little status in her school, so she sought it elsewhere. The constant detentions and suspensions did little to change her negative outlook about school or to provide her with a sense of fairness. Her ability to relate to her peers at school was greatly diminished by her being singled out and separated from them, so she found relatedness with her new peers. She sought autonomy outside of the school setting since no one had legitimately involved her in shaping the scenarios that could lead her to experience a different reality at school. Her certainty was situational and was limited to the positive and negative consequences she could predict from her experiences in school and with her new friends.

Now, what might have happened if Janira's parents and the school had increased her autonomy by providing her with the opportunity to shape some of her work in school, perhaps by asserting greater control over what she learned or how she could demonstrate her learning? How might her sense of certainty and fairness have changed if she had been encouraged to define goals and accept the consequence for not meeting them, or if she could have defined and monitored the actions she was taking toward meeting her goals? How might her status have increased if her teachers or the school administrator had enabled her to share her talents and passion at school?

SCARF elements: teachers and administrators

While one may think that Janira represents a rather extreme case of a student, she is not unique. Many schools struggle to accommodate the needs of students who do not conform in one way or another. Furthermore, alienation such as Janira's is found among other school actors as well.

A few months ago, I was faced with a group of educators immobilized by a deep collective anxiety. The group included school superintendents, technology and data specialists, and school officials charged with helping schools use inquiry and data. The anxiety they displayed resulted from changes in city and state government legislation that called for a reorganization of the Department of Education. As a result, many of the people wondered what their new positions would be. Whereas one might consider that this situation warranted such anxiety, these individuals had deep familiarity with changing legislation and its consequences for schools. Approximately 85 percent of these individuals had experienced at least two reorganizations in the past, and most of them had been working in the educational system for over 15 years. However, despite their prior experiences with significant reorganizations, the group felt demoralized and anxious about their future. During my time with them, they struggled to assimilate the material we were exploring, arguing that they were not sure of the specific situations in which they could apply them.

On the morning of my third day with the administrators, I referred to SCARF as a means to help individuals reframe their thinking around the domains they had some control over. We determined that status, certainty, autonomy, and fairness were not rewards they could access or tap into in their present situation.

We then explored the role that relatedness had played in building the individual and collective resilience of this group, and brainstormed additional strategies for explicitly using relatedness to strengthen their motivation and increase their collective self-efficacy. We identified the givens and uncertainties of their positions, and the group was able to generate tangible strategies for strengthening their social and professional relatedness, including scheduled meetings, informal gatherings, and information-technology networks. Having SCARF as a framework for identifying coping strategies lightened the load everyone was carrying and changed the tenor of the room, thereby enabling them to operate as actors rather than reactors.

The case for SCARF in building engaged schools

I found my SCARF experience with administrators to be quite enlightening and insightful. What follows is a modest attempt at exploring the status and value of different SCARF rewards for different stakeholders in schools, along with some guiding questions they could pose as they consider those rewards within schools.

Recent studies have revealed that there is a positive relationship between our status and our dopamine receptors.

Status

Status refers to the ascribed position in which we place ourselves relative to others in our different communities. Recent studies have revealed that there is a positive relationship between our status and our dopamine receptors (Martineza et al. 2010). This suggests that people who have higher status have a greater ability to experience pleasure. For the most part, administrators possess high status among teachers and students in terms of defining the terms of engagement and enacting policies, programs, and practices. This status is higher for building and district leaders than for middle-level administrators. With ever-increasing external accountability requirements (Abernathy 2007), such status is threatened if the school is not meeting standards but can be enhanced when administrators are able to redirect their attention to the ways in which they inspire, enable, or influence the people they are responsible for. Administrators can increase the status of adults and students in the school by identifying formal leadership roles and providing them with greater autonomy.

Questions administrators could pursue if they wanted to develop distributed leadership structures in the school and increase status rewards for teachers and other adults include:

- How can teachers feel empowered? What actions would increase their status?

- What policies could result in a greater distribution of student status?
- How might the school leverage high-quality work in the school to increase the status of those who produce it?
- How might the teacher evaluation process be redirected toward a focus on growth and improvement?
- How might listening and communication behaviors be used to increase status among staff members, students, and parents?
- What routines or policies might increase our regard for parents' input or contributions toward their children's education?

Teachers tend to have high status among students in terms of enforcing rules and policies, enacting practices, and ascribing value to student work. Their status among peers is less dependent on seniority than on their perceived influence in school. Such status can be threatened by low student performance or by political strife among staff within the school. Teachers can increase the status of students in their classes by providing them with formal leadership roles, a structure that maximizes their choice and autonomy, and opportunities to excel in self-defined areas.

Some of the questions teachers can pursue as they consider enhancing their own status and the status of their students include:

- How can you use or disseminate your expertise about teaching and learning to help others?
- What projects, activities, or routines might reward students for their thinking, work, or values?
- What are the different ways in which students' talents and interests could be acknowledged and fostered?
- What activities or structures could you use to increase the status of students in your own classes and in the school at large?
- What grouping structures might increase students' ability to relate to each other in ways that could increase their status and interdependence?

Teachers tend to have high status among students in terms of enforcing rules and policies, enacting practices, and ascribing value to student work.

Parents have significant status at home, but their perceived status in schools varies, depending on a number of factors that include the school's culture and the ways in which schools invite and engage parental input and participation. In many schools students have low status in terms of making decisions about rules, norms, and work in the school. Their status with peers depends on the perceived pecking order of the traits that students in the school community value. Student status is increased by grades, awards, and excelling in behaviors that are valued. Status is threatened if they do not meet minimum standards or if they go against student-developed norms and behaviors.

Questions students and parents could consider to enhance their status include:

- What do you know, do well, or care about that could help your peers, teachers, or someone else in the school?
- How can you share or use your passions and interests to help others?
- How can your work help someone else learn or do something?
- In what ways could you share what you care about with others?
- Who can you support or help?

Certainty

Certainty refers to the ability to predict the future based on previous experiences and patterns. Access to new information is, in and of itself, highly connected to certainty and is rewarding to the brain. For both administrators and teachers, certainty is high in terms of job security when they are tenured, but it is often compromised in terms of knowing what is expected of them with increasing external accountability demands.

Middle-level managers and teachers experience more or less certainty depending on their specific school assignments since such assignments are sometimes made with limited input from them. Administrators can increase the certainty among those who work for them through transparent and continuous communication and by involving them in decision making, securing their input in terms of job-related responsibilities, and giving them greater control over the allocation or use of school and other resources.

Students' sense of certainty is high in terms of classes, school routines, and expectations. It is also high in terms of their anticipating future subjects, grades, and standards. When students' locus of control is external, or when their teachers are inconsistent in terms of their routines, standards, and expectations, their certainty in terms of predicting their ability to cope or succeed may be compromised.

School administrators and teachers can increase student certainty by ensuring that teachers share similar expectations for student behavior, performance, and work quality through access to explicit and attainable opportunities to learn and through the enforcement of consistent norms.

Questions that increase certainty for all school stakeholders include:

- What can we do to increase our sense of certainty about our values and commitments (at home or at school)?
- What are some nonnegotiables we want to abide by (in school, at home)?
- What policies, processes, and practices do we need to establish, and consistently enforce, to increase everyone's sense of certainty?
- Who can students, teachers, administrators, and others depend on for advice? Support? How can support be more accessible to others?
- In what contexts do individuals and group members feel safe?
- How do we increase the sense of safety for everyone?
- How can we manage information flow and exchanges to promote certainty?
- How can we create a bridge between the sense of certainty all stakeholders feel at home and at school?

Autonomy

Autonomy is the ability to have and make choices and, in a sense, to have the illusion of control. It is highly connected to our sense of efficacy. For administrators, autonomy very much depends on their specific job assignment. District and building leaders tend to have a high degree of autonomy in terms of hiring, allocating, and managing resources and setting policies. The autonomy of middle-level administrators and other staff members very much depends on their supervisors' leadership style and opportunities they provide related to the allocation of resources and the shaping and implementation of policies, processes, programs, and practices.

Teachers who are tenured operate mostly without significant oversight or supervision. Untenured teachers have far less autonomy and experience a great degree of oversight during their untenured period. Their autonomy is greatly increased when they have opportunities to design or revise curriculum and assessment and when they can provide input on policies, programs, and schedules. Both tenured and untenured teachers operate under the pressure of external accountability forces that greatly curtail their perceived autonomy.

Administrators and teachers can increase their own autonomy and the autonomy they provide others by addressing questions such as:

- How can teachers assume greater control and responsibility for curriculum, instruction, or assessment decisions while staying true to the mission and vision of the school?
- In what ways could teachers support each other's learning and work without administrative oversight?
- What school or classroom routines could be implemented and monitored by others? Could be self-monitored?
- How might we increase the amount of discretion or choice that teachers and other staff members have without compromising a unified vision?
- In what context could students have greater choice about what they learn, how they learn, or how they demonstrate their learning attainment?
- How can the evaluation process for both staff members and students incorporate greater attention to goal setting and strategic planning?
- How might teachers' and other staff members' goals become a greater focus of school-related activities and work?

In many schools, student autonomy is low in terms of determining what to learn, how to learn, and how to demonstrate such learning. Teachers and parents can greatly enhance student autonomy by enabling students to set learning goals and determine the means to attain them and then helping them monitor them. They can also increase students' autonomy by providing students with choice in terms of what they learn or how they can demonstrate an understanding of what they have learned.

Questions that can help elicit ways to increase student autonomy include the following:

- In what contexts could students have greater choice about what they learn or do, how they learn it or do it, and how they demonstrate their learning attainment?
- What culminating projects or experiences would increase students' choice and control over their work and presentations?
- How can classroom routines incorporate more and clearer options for students to exercise?
- How could students be encouraged to have greater control over how they spend time in class? At home?
- How can the student evaluation process incorporate greater attention to goal setting and strategic planning?

Relatedness

Relatedness has to do with whether we consider others friends or foes, and about who is in our "in group" and who is in our "out group." The degree to which relatedness is a reward in a school depends very much on the size and culture of the school. For the most part, much of the school day is structured in ways that minimize opportunities for significant adult-to-adult communication, so relatedness occurs informally and is fostered primarily among students and between teachers and students.

The degree to which relatedness is a reward in a school depends very much on the size and culture of the school.

Administrators can increase relatedness for teachers and other adults in the school with opportunities for teachers to work with their peers and with school staff and community members. Teachers can increase relatedness by providing students with varied learning configurations, including peer-to- peer, and varied forms of group work. Students' sense of relatedness varies in terms of their formal and informal opportunities for relationships with peers and family. Parents' sense of relatedness varies depending on the extent to which they feel welcomed and an integral part of the school community. Schools can increase relatedness through opportunities for students to learn and work collaboratively with peers and with other students and adults in the school and in the community.

Questions that increase relatedness between and among all school stakeholders include:

- Who has a sense of community in our school?
- What do we celebrate? When do we celebrate? How can we structure formal and informal opportunities to celebrate what we care about or value?
- What opportunities could we create for teachers, parents, students, and others to learn more about each other's interests, passions, and work?
- How might we increase our ability to work together toward shared goals and interests?
- In what ways and to what ends do we encourage collaboration?
- What can we collaborate on that might increase our regard for each other's expertise?
- How do we minimize cliques?

Fairness

Fairness is the perception of and need for equitable exchange and has to do with feeling that we are treated justly and equitably. According to various neuroscientists, the social pain system in the brain that relates to fairness may have been piggybacked onto the physical pain system during mammalian evolution (Eisenberg and Lieberman 2004; Panksepp 1998).

Depending on their position, administrators may experience a sense of fairness with respect to defining policies, processes, and practices that establish what is fair or not. Depending on their place within the school hierarchy, they may have more or less control related to transmitting or enforcing regulations and policies. They can increase a sense of fairness for adults and students with clear external expectations for policies and practices and by enforcing incentives and consequences consistently.

Teachers' sense of fairness may be different in terms of their perceptions of the school at large vis-à-vis their own classrooms, where they can generate and enforce rules, responsibilities, and expectations. They may have a low sense of fairness if they equate fairness with equal treatment and feel unfairly treated by externally driven policies and regulations. Their sense of fairness can be increased by clear expectations for practices and consistently enforced incentives and consequences and by opportunities to inform expectations and policies. Students are highly sensitive to "unfair" treatment by peers and others. Teachers and administrators can increase their sense of fairness with clear, explicit expectations and consistently applied norms, incentives, and consequences, and through opportunities to participate in the norm-setting or review processes.

The following questions might help teachers and administrators who want to engender a greater sense of fairness for themselves and other members of the school community:

- What social justice agendas do we want to promote?
- How do we help everyone understand the distinction between fair and equitable?
- What school initiatives, programs, or activities can we incorporate that include explicit opportunities for students and others to do good deeds?
- What appeals processes could we implement to promote fair treatment or a more equitable allocation of resources?
- How might we increase the transparency of our standards and expectations?
- How can we ensure a greater constancy in teacher or parent expectations?
- In what ways could we engage staff, student, or parent input in the development, review, or evaluation of policies or in the identification of standards?

Summary and conclusion

Learning occurs only if we are motivated to learn. SCARF enables us to better understand motivation, rewards, and threats in a far more sophisticated manner than the "carrot-and-stick" approach. If status, certainty, autonomy, relatedness, and fairness serve as stimuli to the brain's threat and reward circuitries, contributing to our motivation to learn, it is critical for individuals and schools to consider ways of allocating these rewards so as to maximize learning for all.

A growing body of neuroscience research shows that every action a teacher takes and every decision a teacher makes either supports or undermines the perceived levels of status, certainty, autonomy, relatedness, and fairness among students. In fact, this may be why teaching is so challenging—knowing that every word and glance carries with it social meaning. Sentences and gestures are noticed and interpreted, magnified, and combed for meanings the teacher often never intended. Neuroscience supports the notion that often what the teacher is saying may not be what the students are hearing.

The SCARF model provides a means of alerting the teacher (bringing conscious awareness) to students' core concerns (which they may not even understand themselves) and shows the teacher how to calibrate his or her words and actions to better effect. The process starts by reducing the threats inherent in the classroom and in teacher behavior. Students cannot think creatively, work well with others, or make informed decisions when their threat responses are on high alert. Skilled teachers understand this and act accordingly. The SCARF model also provides a means for students to become more aware of their own needs and the conditions that support their learning. Advancing school practices could enable students to appropriate this knowledge and use it to become more efficacious learners.

For years economists have argued that people will change their behavior if they have sufficient incentive. We now have reason to believe that economic incentives are effective only when people perceive them as supporting their social needs. The SCARF model thus provides students, teachers, and administrators with more nuanced and effective ways to expand the definition of reward. In doing so, SCARF principles also provide a more granular understanding of the state of engagement, in which students can give their best performance. Engagement can be induced when people working toward objectives feel rewarded by their efforts, with a manageable level of threat: in short, when the brain is generating rewards in SCARF-related dimensions.

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SECTION VI: Case Studies