Achievement and the Resilient Brain

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Learning and problem solving redesigns the brain. This article highlights findings from neuroscience and positive youth development on how to foster achievement and build intelligence.

We only think when we have a problem, the solution of which is worthwhile to us.[1] ~John Dewey

To John Dewey, learning to solve problems was more important than acquiring knowledge. In fact, we now know the human brain is designed for problem-solving, and we keep wrestling with unresolved situations even during sleep and dreams. When not facing problems, we invent them, working on puzzles, hobbies, and surfing the internet. As students engage in problem-solving, they create what Dewey called, "habitudes" (i.e., lasting, long-term learning).

The goal must be to nurture both social and academic success in tandem where all students can rise together.

Students who are not interested in school tasks may churn out assignments, but this does not create permanent pathways in the brain. Learning that endures changes the brain in a process called *neuroplasticity*. This term comes from the Greek words for nerve and plasticity, meaning to mold. For example, aspiring London taxi drivers spend three years studying the 25,000 streets they must know to pass a qualifying exam. The result is that the hippocampus, which indexes memories, grows larger than in London bus drivers who follow a fixed route. However, bus drivers are better able to learn new spatial information because their brains are not fully using that capacity.[2]

In *How to Explain a Brain,* Robert Sylwester describes intelligence as "a person's ability to respond successfully to challenge and to learn from such experiences."[3] By this definition, intelligence is resilience. As we master difficult tasks, the brain builds new neural pathways—literally, new intelligence. The brain is designed to become smart, and young people in any setting will learn and thrive if their essential developmental needs are met.[4]

A consilience of knowledge from cross-cultural studies, practice wisdom, and research has identified core developmental needs which are essential for optimum learning and growth. The Model of Leadership and Service portrayed in Figure 1 applies not only to the young, but to adults who serve them. These six brain-based developmental needs are the building blocks of competence and resilience. Here we discuss the inborn motivation for achievement.

The Drive for Achievement

The motivation for mastery of challenges has been called competence motivation. Developing competence is essential for academic success as well as for social and emotional well-being. School achievement is a robust predictor of positive life outcomes, even when students experience other problems in family and community.[5]

Two contrasting motives for achievement have long been recognized by researchers:[6]

Egoistic motivation is wrapped in the belief *I want to be better than others*. Although competition can be a motivator, it can also undermine creativity and problem-solving ability. Youth who fear failure may avoid difficult challenges and show helplessness or problem behavior.

Task motivation is seen in the mindset *I want to do my best*. The focus is on developing skill and understanding instead of being preoccupied with needing to impress others. This is the brain's natural, intrinsic mastery drive which is called *flow* since the brain is on a roll searching for solutions.[7]

Persons who gain high levels of expertise in any area have developed brain circuits that are hun-

Figure 1

Your compass to positive youth development

dreds of times more efficient than those of a novice. Carol Dweck has shown that achievement is strongly related to one's personal belief about intelligence concerning these two different mindsets:[8]

> *Intelligence is a fixed trait.* You either have it or don't. Such persons avoid risking failure and give up in the face of difficulty.
>
> *Intelligence can be grown with hard work.* These persons stick with difficult tasks and use failure as feedback to help them succeed.

Fortunately, one can change this mindset among young people by teaching them that talent is something that is developed, not something controlled by genes. Of course, if adults are biased by the belief that some kids just don't have potential, it will be hard for youth to rise above those low expectations.

A close supportive bond with an adult is a potent predictor of school success.

In her book *Grit: The Power of Passion and Perseverance,* Angela Duckworth provides evidence that IQ and "natural talent" do not drive success. Rather, students who develop interest in some area engage in more serious practice, find a sense of purpose, and achieve at high levels of excellence. Duckworth was the daughter of a scientist father who belittled her lack of genius and was furious when she chose to work with children rather than pursue medical school. Deeply inspired as a college student teaching enrichment classes for disadvantaged students, she found purpose for her future career. Ironically, this girl without genius would receive a MacArthur Fellowship genius grant. When she finished writing her book *Grit,* she went to visit her father who was disabled by Parkinson's disease. She read to him the entire book line by line and, when she finished, he nodded and smiled.

Mastering difficult challenges fosters neuroplasticity and builds resilience. Overcoming *desirable difficulties* also strengthens academic learning. For example, research shows that test taking is a more effective learning tool than rereading content, since tests give practice in retrieving memories.[9] Basically, a learner who does not tax memory is robbed of the powerful learning opportunity that comes from the more difficult task of recalling what one has learned. Simply, knowledge that is stored in memory but cannot be recalled is useless. Frequent testing for feedback (instead of just for grading performance) is a powerful memory builder.[10] Thus, the most important role for tests may not be for assessment, but for frequent practice in recalling what has been learned.

There is growing recognition that schools have become captive to the zero sum game of "race to the top." Instead, the goal must be to nurture both social and academic success in tandem where all students can rise together. An example comes from Japanese schools which are distinguished by high levels of achievement. However, the foundation for high performance in high school is early school experiences that bind children to the school community. Instead of celebrating individual excellence, the focus is on the cooperative pursuit of learning. Japanese children help one another master challenging academic goals, outperforming their American counterparts at all grade levels. The ethos of Japanese schools is kindness, cooperation, and peer helping, not test scores. Students do most of their work in small, stable groups which are like families. And while American teachers are cautioned not to get too close to students, Japanese teachers build bonds that touch the heart.[11]

Social and emotional learning is not an optional add-on to the curriculum, but rather the evidence-based essentials for successful learning and positive life outcomes.[12] However, the most powerful impact comes not from some formal "evidence-based" curriculum but from creating a climate of belonging and respect. Research on resilience shows that when children are lacking stable and supportive relationships at home, the school can nurture these unmet needs. A close supportive bond with an adult is a potent predictor of school success.[13] With no close adult relationship, less than half of students do not succeed in school, but even one close relationship raises the success rate to eighty per cent.

Powerful Synergies

In 1990, three faculty members at Augustana University co-authored the first edition of *Reclaiming Youth at Risk*—a synergy of three distinct sources of knowledge.[14] Native American studies professor Martin Brokenleg shared the cultural wisdom of tribal peoples who treated children as sacred beings through values of belonging, mastery, independence, and generosity. Education professor Steve Van Bockern introduced leading-edge initiatives for creating brain-friendly schools. Finally,

psychologist Larry Brendtro contributed research evidence and practice expertise on positive youth development.

Over the past quarter of a century, hundreds of colleagues have helped to build an international reclaiming movement[15] which provides the foundation for social and emotional learning (SEL).[16] Van Bockern has created a blueprint for creating *Schools that Matter.*[17] First, adults must meet their own developmental needs if they are to spark social and emotional intelligence in young people. Second, schools must nurture the growth needs of children and adolescents in order to unleash untapped potentials. Third, a rich, experiential, brain-friendly curriculum can engage even the most reluctant learners. Other colleagues continue to produce rich literature on applying positive youth development principles in all settings serving children and families. Three examples: Mark Freado has piloted a new model of strength-based assessment which engages youth at risk in developing positive plans for growth.[18] Julie Ashworth and colleagues have demonstrated how restorative discipline practices can transform climates of schools.[19] Debbie Espiner and Diane Guild of New Zealand have created a curriculum for parents seeking to build resilience in their children.[20]

Mark Strother, one of the creators of the Model of Leadership and Service, has observed that the six drives pictured in Figure 1 have an exponential effect which can be presented as D^6. In our current discussion, achievement is strengthened by each of the other components. For example, when students experience belonging in school, achievement soars. In contrast, failure to meet this need can have disastrous effects on learning. Below, we briefly highlight these synergistic relationships.

Safety and Achievement. Students must feel safe in order to be free to learn. Pioneer achievement researchers Atkinson and colleagues documented factors affecting achievement motivation. The most notable impediment to learning was the avoidance motive, *fear of failure,* which is the mirror opposite of the motive to approach and take risks in learning. In the social domain, bullying and peer harassment sabotage a safe learning environment.[21] *The Youth Voice Project* is a striking study based on reports by thousands of students on their experience with bullying and peer mistreatment.[22] Young people had little confidence in interventions purporting to make them safe. The widespread failure of bullying prevention programs was further documented in a large meta-analysis by Juvonen and Graham.[23] Superficial bully prevention efforts fail because these do not change the culture of the school or instill values of respect among members of the school community. Since bullying is toxic to school achievement, all adults, in collaboration with students, are responsible for building climates of safety and success. Schools are also facing increasing challenges with populations of traumatized children, including many from immigrant backgrounds who bring horrendous experiences. An absolute prerequisite for achievement with such students is for schools to become a sanctuary in which they can heal and learn.[24]

Belonging and Achievement. *The human social brain is designed to learn in community.* Research has shown that two qualities distinguish effective alternative schools for youth at risk: teachers know how to build trusting relationships with students who don't trust teachers, and these connections enable them to help students experience success. The climate of the school strongly shapes levels

of achievement. When students fear social rejection, this emotional distress overpowers the thinking brain and inhibits learning. Schools face a formidable challenge in a broader culture marked by gender, racial, religious, ethnic, and identity prejudice. For example, when students of color experience race-based rejection, this fuels insecurity and doubt. Researchers call this *belonging uncertainty* and found that sixty percent of the variation in confidence about one's ability to succeed was determined by levels of stress in racial situations.[25] Social psychologist Eliot Aronson notes that school desegregation actually was followed by an increase in prejudice and failed to improve self-esteem of minority students from impoverished backgrounds.[26] Cooperative learning is a tested format for building social responsibility and empathy as well as academic competence. His jigsaw classrooms give each student in groups of six the task of presenting some piece of knowledge. Instead of competition to see who is smartest, a climate is created where racial, gender, and socio-economic divisions can be overcome.

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Power and Achievement. *Self-determination fosters intrinsic learning.* All power begins with control over oneself. A growing body of research indicates that students who can self-regulate emotions, thinking, and behavior are more effective learners.[27] Power is also tied to self-efficacy, the sense of control over one's destiny. Powerless persons experience learned helplessness and easily give up. Maslow observed that students with low self-esteem crumble more easily in stressful situations, while those with more confidence can manage the risk of failure.[28] School failure is an attack on one's sense of self-worth; some students seek to restore fragile self-respect by defying teachers and rejecting school. Autocratic adult authority and peer bullying are other examples of maladaptive power as students being dominated or abused are deprived of their own sense of power. Ironically, traditional school discipline is built on manipulating rewards and punishment, which fails to develop intrinsic motivation and self-determination.[29] While adult power underlies behaviorally focused school discipline, a strong evidence base exists for empowering students in settings organized around positive youth development.[30]

Purpose and Achievement. *Contributing to others is a powerful motive for achievement.* Lives of purpose are closely linked with positive concern for others.[31] Maslow recognized this and added self-transcendence—commitment beyond self—as the highest level of his revised hierarchy of needs.[32] Altruistic motivation and helping behavior flourish in early childhood. A recent study published in the *Journal of American Public Health* followed over 700 children from kindergarten until they turned 25. The results were startling: children who were socially competent in kindergarten, i.e., sharing and helping other kids, were much more likely to attain higher education than those less socially competent. Another large longitudinal study by Albert Bandura's colleagues in Italy found that helping and consoling others in third grade was the strongest predictor of academic success in eighth grade, even more potent than third grade achievement scores.[33] Research in peer helping programs showed that high-risk youth with long histories of poor school performance experienced a surge in achievement with an average two years' academic gains for each year in these climates of positive peer support.[34]

Adventure and Achievement. *The need for adventure applies to teachers as well as students.*[35] In contrast to more staid adults, young people are strongly motivated to explore the world and test their prowess by taking risks. Curiosity is highest in young children, and the need for stimulation and adventure reaches an apex in the adolescent brain. While this motivation can be harnessed by sports and organized recreation, the brain needs unstructured opportunities for play and adventure to fully develop. Ironically, sedentary schools thwart this drive. Recognizing that most risk taking is a normal part of growing up is no easy task for professionals or parents who are naturally concerned about preventing dangerous risks. But sensible risk-taking is a healthy behavior, preparing young people to take on new challenges, learn about the world, and shape their identities.[36] Dewey encouraged schools to tap the natural motivation for play, exploration, and joyous emotion. "Experience has shown that when children have a chance at physical activities which bring their natural impulses into play, going to school is a joy, management is less of a burden, and learning is easi-

er."[37] Nicholas Hobbs called for creating schools of joy and observed that school success, "especially for students who expect and dread failure, is to know a sharp delight. It is like spitting from the top of a windmill."[38]

Conclusion

A century ago, John Dewey's epic book *Democracy in Education* proposed a blueprint for schools which is still applicable today.[39] His visionary principles have been validated by modern neuroscience and research on learning and positive youth development. For example:

The most powerful learning is experiential, learning by doing. Then as now, hands-on activities and practical courses have been seen as less important than a traditional academic curriculum. However, the brain is geared to solve real-world problems, and experiential activities are essential to engage disinterested students and provide learning that transfers to real-life settings.

Content learning can be organized to foster critical thinking. Accumulating factoids is futile in an age where we are overwhelmed by data which is confusing, contradictory, and often erroneous. It is abundantly clear that citizens need to be able to sort out what is important and true. "Either we learn how to navigate the tidal wave of content and information coming at us or we drown in the deluge."[40]

Schools have the task of conveying core values of democracy. Dewey saw schools as cooperative communities that taught young people how to live in a climate of respect. This vision is being rekindled by exciting new research on the power of social and emotional learning which not only enhances achievement but creates long-term positive life outcomes.

The most powerful learning is experiential, learning by doing.

Dewey was well aware that children in modern society were receiving less guidance from families and that schools were bearing broader responsibility for meeting their developmental needs. His vision was that all of our schools would become embryonic communities, reflecting the best ideals of the larger society, committed to developing practical skills as well as academic learning, and enlivened by the arts:

> *When the school introduces and trains each child of society into membership in such a little community, saturating him with the spirit of service, and providing him with the instruments of effective self-direction, we shall have the deepest and best guaranty of a larger society which is worthy, lovely, and harmonious.*[41]

References

Aronson, E. (2015). Reducing prejudice and building empathy in the classroom. In M. Gernsbacher & J. Pomerantz (Eds.), *Psychology in the real world* (pp. 250-256). New York, NY: Worth Publishers.

Ashworth, J., Van Bockern, S., Ailts, J., Donnely, J., Erickson, K., & Woltermann, J. (2008). The restorative justice center: An alternative to school detention. *Reclaiming Children and Youth, 17*(3), 21-26.

Atkinson, J., & Raynor, J. (1974). *Motivation and achievement.* New York, NY: John Wiley & Sons.

Bath, H., & Seita, J. (2016). *Helping kids who hurt: Three pillars of transforming care.* New Castle, NSW, Australia: Allambi.

Bjork, E., & Bjork, R. (2015). Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning. In M. Gernsbacher & J. Pomerantz (Eds.), *Psychology in the real world* (pp. 60-68). New York, NY: Worth.

Brendtro, L., Brokenleg, M., & Van Bockern, S. (1990). *Reclaiming youth at risk: Our hope for the future.* Bloomington, IL: Solution Tree.

Brendtro, L., & Mitchell, M. (2015). *Deep brain learning: Evidence-based essentials in education, treatment, and youth development.* Albion, MI: Starr Commonwealth.

Brokenleg, M. (2016). 25 years of learnings. In CF Learning (Ed.), *A thousand fires burning: Reclaiming youth at risk,* pp. 7-8. Lennox, SD: CF Learning.

Caprara, V., Barbaranelli, C., Pastorelli, C., Bandura, A., & Zimbardo, P. (2000). Prosocial foundations of children's academic achievement. *Psychological Science, 11*(4), 302-306.

CF Learning (2016). *A thousand fires burning: Reclaiming youth at risk.* Lennox, SD: CF Learning Publications.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experiences.* New York, NY: Harper Perennial.

Damon, W. (2008). *The path to purpose: How young people find their calling in life.* New York, NY: Free Press.

Davis, S. & Nixon, C. (2013). *Youth voice project: Student insights into bullying and peer mistreatment.* Champaign, IL: Research Press.

Dewey, J. (1900/1990). *The School and society: The child and the curriculum*. Chicago, IL: University of Chicago Press.

Dewey, J. (1916). *Democracy and education*. New York, NY: Macmillan.

Duckworth, A. (2016). *Grit: The power of passion and perseverance*. New York, NY: Scribner.

Durlak, J., Weissberg, R., Dymnicki, A., Taylor, R., & Schellinger, K. (2010). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*(1), 405–432.

Dweck, C. (2006). *Mindset: The new psychology of success*. New York, NY: Random House.

Elias, M., Leverett, L., Duffell, J., Humphrey, N., Stepney, C., Ferrito, J. (2015). Integrating SEL with related prevention and youth development approaches. In J. Durlak, C. Domitrovich, R. Weissberg, & T. Gullotta (Eds.), *Handbook of social and emotional learning* (pp. 33-49). New York, NY: Guilford Press.

Espiner, D., & Guild, D. (2016). *Rolling with resilience: Building family strengths*. Auckland, New Zealand: Authors.

Freado, M. (2016). Transforming assessment. In CF Learning (Ed.), *A thousand fires burning: Reclaiming youth at risk,* pp. 7-8. Lennox, SD: CF Learning.

Gambone, M., Klem, A., & Connell, J. (2002). *Finding out what matters for youth: Testing key links in a community action framework for youth development*. Philadelphia, PA: Youth Strategies, Inc., and Institute for Research and Reform in Education.

Golinkoff, M., & Hirsh-Pasek, K. (2016). *Becoming brilliant: What science tells us about raising successful children*. Washington, DC: American Psychological Association.

Hazel, C. (2016). *Empowered learning in secondary schools*. Washington, DC: American Psychological Association.

Hobbs cited by Valore, C. (2002). Spitting from windmills: The therapeutic value of effective instruction. *Reclaiming Children and Youth, 11*(2), 85-86.

Horwood, B. (1999). Educational adventure and schooling. In J. Miles & S. Priest (Eds.), *Adventure programming*. State College, PA: Venture Publishing, Inc.

Jones, D., Greenberg, M., & Crowley, M. (2015). Early social-emotional functioning and public health: The relationship between kindergarten social competence and future wellness. *American Journal of Public Health: November 105*(11), pp. 2283-2290.

Juvonen, J. & Graham, S. (2013). Bullying in schools: The power of bullies and the plight of victims. *Annual Review of Psychology, 65,* 159-185.

Koltko-Rivera, M. (2006). Rediscovering the later version of Maslow's hierarchy of needs: Self-transcendence and opportunities for theory, research, and unification. *Review of General Psychology, 10*(2), 302-317.

Lewis, C. (1995). *Educating hearts and minds: Reflections on Japanese preschool and elementary education*. New York, NY: Cambridge University Press.

Maguire, E., Woollett, K., & Spiers, H. (2006). London taxi drivers and bus drivers: A structural MRI and neuropsychological analysis. *Hippocampus, 16*(12), 1091-1101.

Maikoetter, M. (2011). From intuition to science: Re-ED and trauma-informed care. *Reclaiming Children and Youth, 19*(4), 18-22.

Maslow, A. (1955). Deficiency motivation and growth motivation. In M. Jones (Ed.), *Nebraska symposium on motivation* (pp. 1-30, 65-69). Lincoln, NE: University of Nebraska Press.

Nicholls, J. (1990). What is ability and why are we mindful of it? A developmental perspective. In R. Sternberg & J. Kolligan, Jr. (Eds.), *Competence considered* (pp. 11-40). New Haven, CT: Yale University Press.

Nota, L., Soresi, S., & Zimmerman, B. (2004). Self-regulation and academic achievement and resilience: A longitudinal study. *International Journal of Educational Research, 41*(3), 198-215.

Ponton, L. (1997). *The romance of risk: Why teenagers do the things they do*. New York, NY: Basic Books.

Roediger, HIII, H., McDermott, K. & McDniel, M. (2015). Using testing to improve learning and memory. In M. Gernsbacher & J. Pomerantz (Eds.), *Psychology in the real world* (pp. 69-78). New York, NY: Worth.

Ryan, R., & Deci, E. (In press). *Self-determination theory*. New York, NY: Guilford Press.

Strother, M., Maikoetter, M., Freado, M., & Brendtro, L. (2016). The drive to thrive: Lighting the fire. In CF Learning (Ed.), *A thousand fires burning: Reclaiming youth at risk* (pp. 39-51). Lennox, SD: CF Learning.

Sylwester, R. (2005). How to explain a brain: An educator's handbook of brain terms and cognitive processes. Thousand Oaks, CA: Corwin Press.

Tully, F. (2016). The roots of reclaiming youth. In CF Learning (Ed.), A thousand fires burning: Reclaiming youth at risk, pp. 9-1. Lennox, SD: CF Learning.

Van Bockern, S. (2016). Schools that matter. In CF Learning (Ed.), *A thousand fires burning: Reclaiming youth at risk* (pp. 18-21). Lennox, SD: CF Learning.

Walton, G., & Cohen, G. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology, 92*(2), 234-244.

Zeigarnik, B. (1927). Das Behalten von erledigten und unerledigten Handlungen. (The memory of completed and uncompleted tasks.) *Psychologische Forschung, 9,* 1-85.

Zelazo, P., Carter, A., Reznick, S., & Frye, D. (1997). Early development of executive function: A problem-solving framework. *Review of General Psychology, 1*(2), 198-226.

Zimmers, P. (1918). *Teaching boys and girls how to study.* Madison, WI: Parker Educational Company.

(Endnotes)

1 Dewey, Zimmers, 1918, p. 17

2 Maguire, Woollett, & Spiers, 2006.

3 Sylwester, 2005, p. 87.

4 Strother, Maikoetter, Freado, & Brendtro, 2016

5 Brendtro & Mitchell, 2015.

6 Nicholls researched these two goals for achievement in 1990. Zeigarnik in 1927 described these two types of motivation as well as a third motivation, pleasing persons in authority.

7 Csikszentmihalyi, 1990.

8 Dweck, 2006.

9 Roediger, McDermott, & McDaniel, 2015.

10 Bjork & Bjork, 2015.

11 Lewis, 1995.

12 Durlak et al., 2010.

13 Gambone, Klem, & Connell, 2002.

14 Brendtro, Brokenleg, & Van Bockern, 1990.

15 Brokenleg, 2016, Tully, 2016.

16 Elias et al., 2015.

17 Van Bockern, 2016.

18 Freado, 2016.

19 Ashworth et al., 2008.

20 Espiner & Guild, 2016.

21 Atkinson & Raynor, 1974.

22 Davis & Nixon, 2013.

23 Juvonen & Graham, 2013.

24 Bath & Seita, 2016; Maikoetter, 2011.

25 Walton & Cohen, 2007.

26 Aronson, 2015.

27 Nota, Soresi, & Zimmerman (2004).

28 Maslow, 1955.

29 Ryan & Deci, in press.

30 Brendtro & Mitchell, 2015; Hazel, 2016.

31 Damon, 2009.

32 Koltko, Rivera, 2006.

33 Caprara et al., 2000.

34 Brendtro & Mitchell, 2015.

35 Horwood, 1999, p. 11.

36 Ponton, 1997.

37 Dewey, 1916, p. 194.

38 Hobbs, cited in Valore, 2002, p. 85.

39 Dewey, 1916.

40 Golinkoff & Hirsh-Pasek, 2016, p. 159-160.

41 Dewey, 1900/1990, p. 28.