ELEMENTS Ed

RESEARCH + INSIGHTS + STRATEGIES

MAKING KIDS SMARTER

ARE WE UP TO THE TASK?

INTELLIGENCE AND CREATIVITY
An Interview with Scott Barry Kaufman

NEUROSCIENCE AND LEARNING STYLES
Barbara Oakley

AN UNCONVENTIONAL EDUCATION
Tony Wagner

ISSUE 02 • 2024


“Intelligence is the ability
to adapt to change.”
Stephen Hawking

ELEMENTS *from the* PAST

by Jill Butler

A l'École [At School]. A postcard from the set *En L'An 2000* [In the Year 2000]. These futuristic pictures by Jean-Marc Côté and other artists were originally commissioned by Armand Gervais for the Exposition Universelle of 1900 in Paris.

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ELEMENTS Ed
RESEARCH + INSIGHTS + STRATEGIES

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Letter from the Editor

Our world is shifting. The planet is getting warmer, labor markets are changing, conflict is rampant. At the same time, new innovations are emerging to help us meet the challenges we face—innovations like artificial intelligence, which has brought us into uncharted territories of human knowledge and experience, and online education, which, as we explored in our first issue, is taking new, rigorous forms. As we contemplated the unsettling changes around us—both the positive ones and the more daunting ones—we asked ourselves: How are we preparing our children and students to be leaders and problem-solvers in a rapidly changing world? How are we preparing them to face an uncertain future? What does it mean to engage in conversations that feel vital for our survival? What does it mean to be smart in this era? This second issue attempts to answer those and related questions—with a focus especially on that last one.

We propose that being smart is about not only how much or how well we learn but also our capacity to use knowledge and thinking skills to anticipate, identify, and solve complex problems across our entire lives.

In this issue, our discussion with Scott Barry Kaufman helped expand the narrow scientific definition of intelligence, allowing us to see that intelligence and creativity are more than just cognitive abilities—they're vehicles to self-actualization. Raising smart children entails cultivating a variety of cognitive capacities, such as empathy, compassion, and critical thinking. Empathy and compassion are essential for understanding and appreciating others' perspectives, and they develop in a reflective cycle, which is explored by Tyler Miller and colleagues through their interviews with students. Charlie Xavier discusses critical thinking skills that enable us to become aware of and eventually mitigate biases that might cloud our judgment and impair our decision-making. These cognitive skills are necessary in today's world, where the root of many conflicts can be found in an us vs. them mentality.

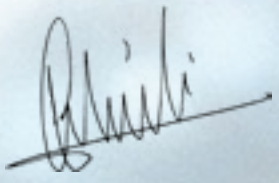
Enhancing decision-making skills is also pivotal for understanding and solving complex problems. Hannah Diamond and Jinsol Lee demonstrate how probabilistic reasoning can help children navigate a world filled with uncertainty by enabling them to make judgments and decisions based on the best available information. As artificial intelligence is gaining prominence in our daily lives, Yangzi Zhao illustrates why AI literacy is important and how we can harness the technology to augment our thinking and intelligence in an environment in which AI will potentially impact all aspects of educational experience, from curriculum design to assessment. Finally, being smart entails the ability to reflect on one's own learning and thinking. Anne Baldisseri and her

team share their research on developing metacognitive skills to empower children to understand how they learn best, what they need to do to learn better, and to take charge of their learning process.

In addition to exploring intelligence, we also highlight in this issue the critical role of designing learning experiences. The science of learning teaches us that we learn best when we are active and engaged, when learning is open-ended, meaningful, and interactive. Designing authentic learning experiences that challenge students to apply their knowledge in diverse contexts is essential. Two articles on playful learning highlight how play can create joyful experiences for children while promoting their social and emotional wellbeing and academic skills. They offer suggestions for using productive playful learning both at home and in classrooms. When combined with concrete learning goals, play can help achieve the complex challenge of making kids smarter. While research studies have indicated numerous benefits of unstructured play, our conversation with Tony Wagner directs our attention to a more intentional form—disciplined play. Wagner contends that disciplined play, when driven by passion and purpose, can instill intrinsic motivation and guides us toward mastery and proficiency, which should be the ultimate goal of education. It is not only meaningful learning experiences that matter but also learning contexts. Place-based learning fulfills this principle by creating opportunities for students to engage with their communities, establish meaningful connections, and apply their learning in practical ways.

When searching for ways to design learning experiences that will make our children smarter, we often find that the narrow definitions used in the context of research do not always align with how parents, educators, and the general public use and understand these terms. In a thought-provoking article, Barbara Oakley addresses the contentious issue of learning styles to highlight an underlying, almost implicit conflict in our goal to bridge educational research with educational practices.

We hope that this issue sparks conversation and commitment to exploring these issues further. Bringing together the voices of thought leaders, scholars, and educators who are working at the intersection of cognitive science, psychology, and education, our goal is to provide new frameworks for understanding intelligence alongside research-proven, practical advice on how parents, educators, and communities can work together to make kids smarter.



Terms of Art

We aim to broaden the concept of intelligence beyond cognitive abilities, innate talent, or academic success, emphasizing qualities like empathy, long-term thinking, and problem-solving. These attributes are integral to a well-rounded, purposeful, and fulfilling life, forming the cornerstone of true intelligence. To foster deeper understanding of alternative intelligence frameworks, we offer concise definitions of key concepts and terms featured throughout this issue.

Cognitive biases are unconscious errors in judgment, decision-making, and problem solving as a result of the brain's tendency to automate familiar processes.

Compassion is the sense of concern for the suffering of others and an aspiration to see that suffering relieved.

Dual processing refers to the theory that cognition and decision-making are carried out by two distinct kinds of thinking: (1) a rapid, automatic, and almost reactionary process in response to familiar stimuli and (2) slow, focused cognition.

Empathy is the capacity to understand others' perspectives and feel their emotions.

General intelligence (g factor) refers to a broad cognitive ability that explains how a variety of specific abilities—such as working memory capacity, processing speed, or reasoning among others—are related.

Guided play is a technique to create activities that naturally engage and support children in play to help them reach learning goals.

Intelligence quotient (IQ) is a measure of intelligence based on performance on cognitive tests.

Learning style refers to the notion that teaching students according to their preferences will result in improved learning.

Metacognition is the ability to understand and regulate one's own thinking and learning.

Multiple intelligence theory posits that intelligence manifests itself to different degrees in areas such as music, visual-spatial, linguistic, logical-mathematical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic intelligence, and that the manifestations differ among individuals.

Place-based education is an approach that emphasizes forming connections with the local environment and community while incorporating real-world circumstances into the learning process.

Probabilistic thinking or **probabilistic reasoning** is making predictions about future outcomes by considering the risks, rewards, and consequences of all options in a given decision.

Thinking skills refers to cognitive abilities used to organize information, ask questions, make connections, and understand and solve problems.

Intelligence Research and Testing

1884

Sir Francis Galton, who coined the phrase "nature versus nurture," sets up an anthropometric laboratory in a London museum to see if "achievement of eminence" can be tested to understand the effects of socialization and heredity. Within a year, he collects data from over 9,000 visitors on social class, physical measurements, reaction times, and ability to discriminate between visual and auditory stimuli. Galton later conducts studies of twins raised in different environments, leading to his belief that intelligence is determined by heredity more than an individual's environment. Based on this, he founds the eugenics movement that rationalized racist ideas, with profound and disastrous societal impacts.

1904

Drawing from the observation that schoolchildren's grades across seemingly unrelated subjects were positively correlated, Charles Spearman, a British psychologist, proposes that these correlations reflect the presence of a dominant factor, which he terms g for "general" intelligence or ability.

.....

The French government asks Alfred Binet and Theodore Simon to help decide which students are most likely to experience difficulty or success in schools. The Binet-Simon Intelligence Scale, scaled by "mental age," includes 30 items designed to test mental capabilities. For instance: if someone scores as well as an average 14-year-old, they have a mental age of fourteen. Jean Piaget, whose theory of cognitive development would plant the seeds for developmental psychology, spends a year working with Binet in scoring intelligence tests.

1908

Herbert Goddard translates the Binet-Simon scale and begins using it in the United States.

1912

Wilhelm Stern develops the intelligence quotient (IQ), which expresses a relation between mental age and chronological age. According to his calculations:

$$\text{IQ} = \frac{\text{mental age}}{\text{chronological age}} \times 100$$

1916

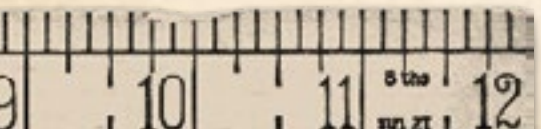
Stanford University psychologist Lewis Terman adapts Binet's original test. The Stanford-Binet Intelligence Scale becomes the standard intelligence test in the United States.

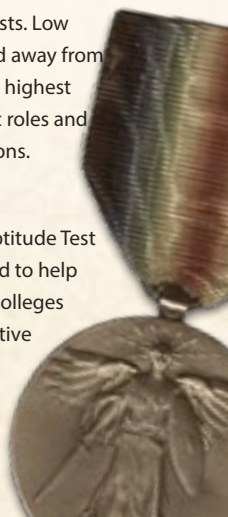
1917

During World War I, Robert Yerkes—president of APA and chair of the Committee on the Psychological Examination of Recruits—develops the written Army Alpha and oral Army Beta tests. Low scorers are turned away from service, while the highest could get specific roles and leadership positions.

1926

The Scholastic Aptitude Test (SAT) is developed to help universities and colleges evaluate prospective students.





1938

Louis Thurstone publishes *Primary Mental Abilities*, asserting that intelligence includes a number of primary cognitive abilities, such as verbal relations, numerical facility, memory, and perceptual ability.

1939

American psychologist David Wechsler describes intelligence as "the global capacity of a person to act purposefully, to think rationally, and to deal effectively with his environment."

1955

Wechsler, dissatisfied with Binet's system, creates a new measurement system known as the Wechsler Adult Intelligence Scale (WAIS).

1956

Logic Theorist, the first computer program simulating humans' abilities to solve complex problems, is introduced by Herbert Simon and Allen Newell. Through its ability to manipulate symbols, try different methods, and modify processes based on experience, the program stands as an early example of artificial intelligence.

1980

Emphasizing that intelligence is not singular but multiple, Howard Gardner proposes eight dimensions of intelligence: linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, intrapersonal, interpersonal, and naturalist.

Opposing Gardner's theory of multiple intelligences, Sternberg proposes a "triarchic theory" of three intelligences: analytical, creative, and practical.

1984

Researcher Richard Flynn publishes evidence that average human IQ has increased over time, also known as the Flynn Effect.

1997

An editorial in the journal *Intelligence*, signed by eminent researchers posits that intelligence is more than book learning or good test-taking skills; it's "the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience."

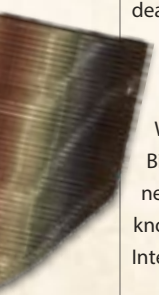
Reigning world chess champion and grandmaster Gary Kasparov is defeated by IBM's Deep Blue, a chess-playing computer program.

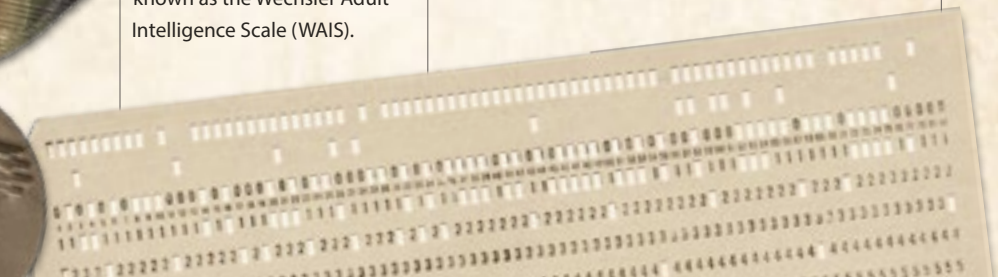
2020

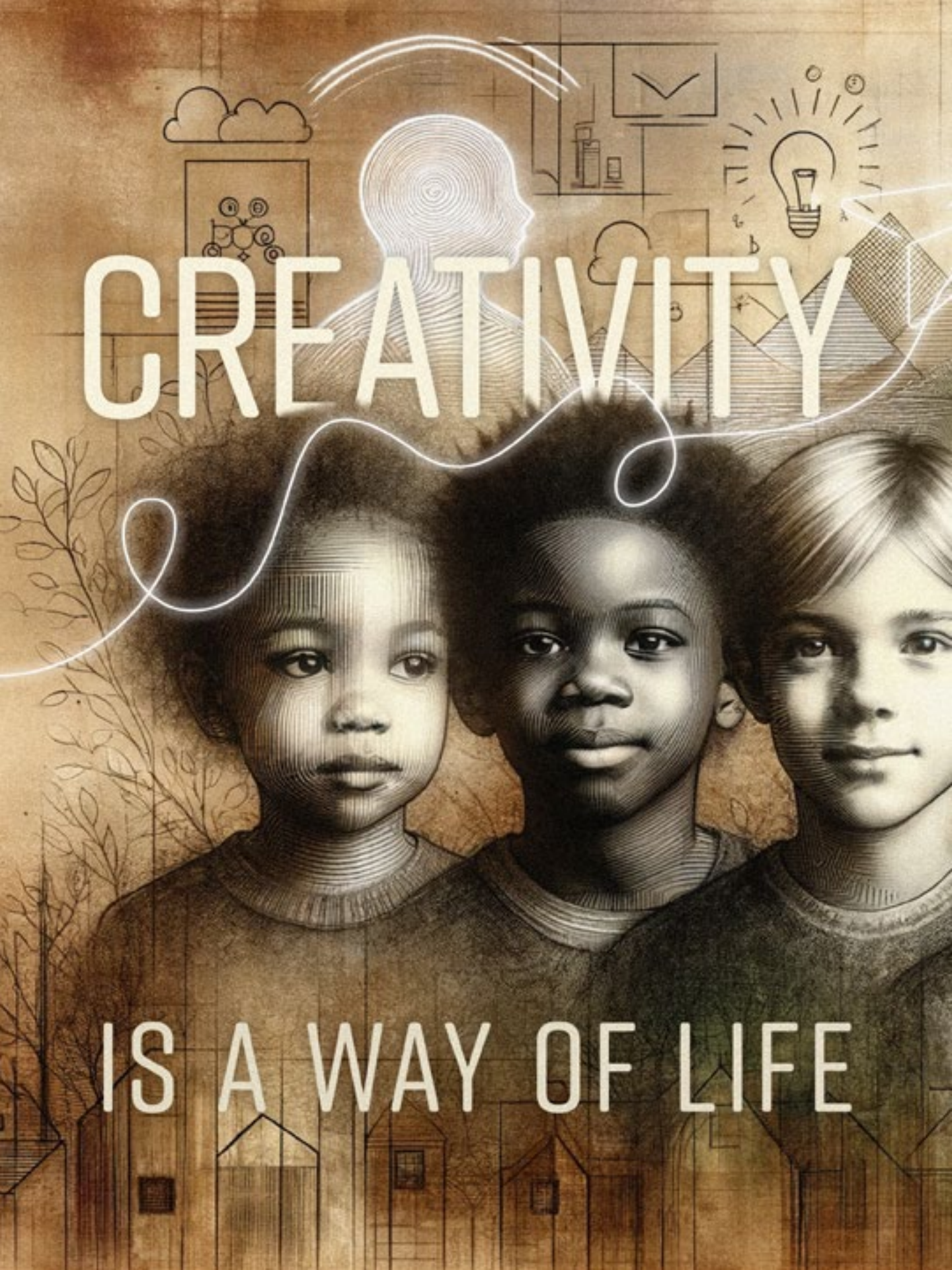
OpenAI starts beta testing GPT-3 to create code, poetry, and other language content. Its output is uncannily similar to that created by humans.

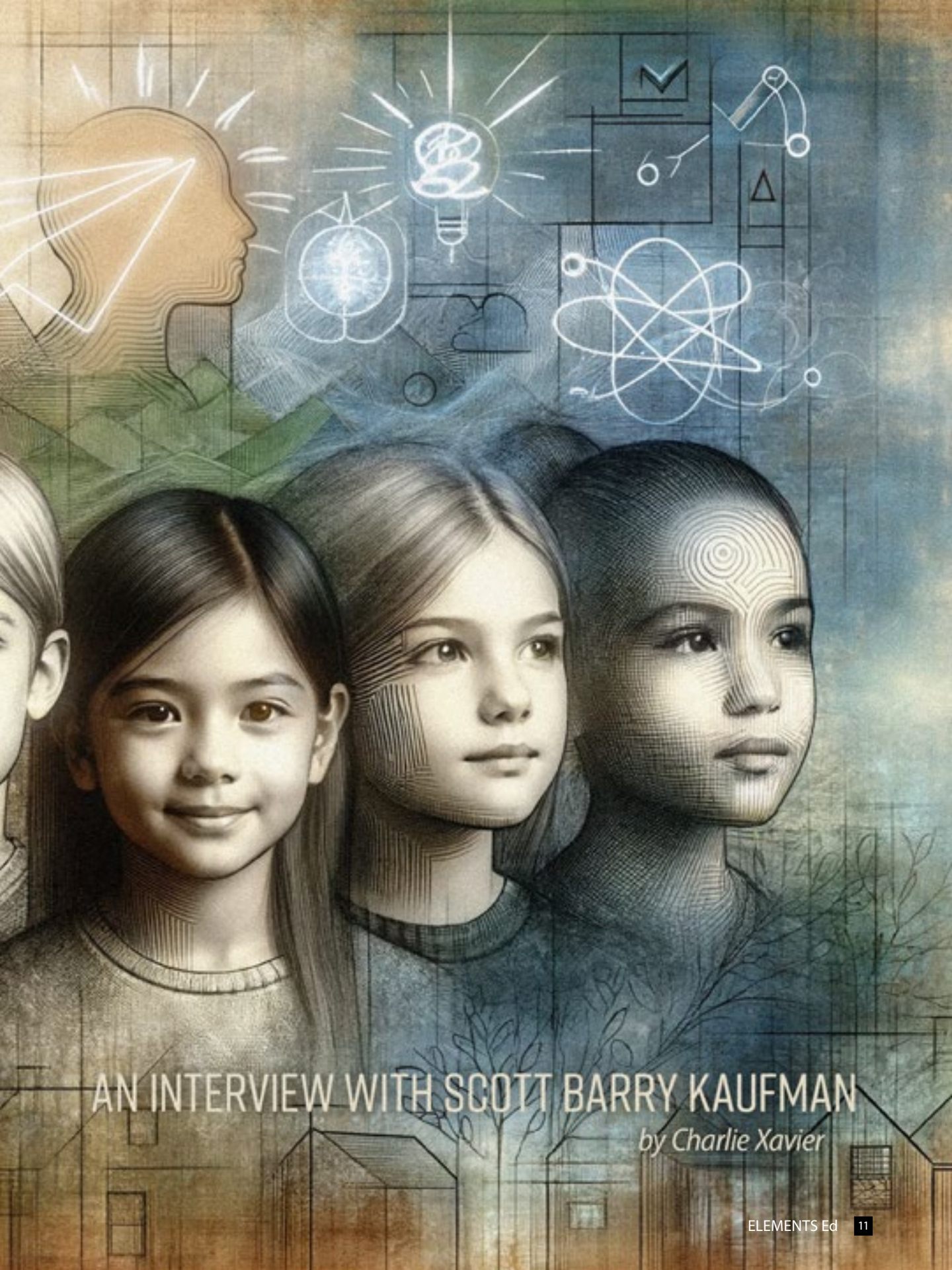
2022

ChatGPT is released.






CREATIVITY
IS A WAY OF LIFE



AN INTERVIEW WITH SCOTT BARRY KAUFMAN

by Charlie Xavier

Scott Barry Kaufman is a cognitive scientist whose areas of research include intelligence, creativity, and the depths of human potential. Kaufman's work focuses on helping all kinds of people live creative, fulfilling, and self-actualized lives. In addition to hosting the popular podcast *The Psychology Podcast*, Kaufman is the author and editor of ten books, including *Ungifted: Intelligence Redefined; The Philosophy of Creativity: New Essays; Wired to Create: Unraveling the Mysteries of the Creative Mind;* and *Transcend: The New Science of Self-Actualization*. He has published articles in *The Atlantic, Scientific American, Psychology Today,* and *Harvard Business Review*. We were fortunate to have the opportunity to talk with Kaufman about his perspective on intelligence and creativity — and on what we can do to make kids smarter.

This interview was edited for clarity and length.

CX *The question this issue of ElementsEd asks is whether we're up to the task of making kids smarter. We aim to think about what it means to make kids smarter and how we're doing that. What is intelligence? And in what ways are we missing the mark? So my first question for you is: From your perspective, particularly given the neuroscience and research side of your work, are there particular traits or factors that make a person smart? And if so, what are they?*

SBK Well, if you start to define intelligence as anything that you are good at, then it starts to lose its meaning. But if you have too narrow a definition of intelligence, then you really miss out on a lot of intelligent people because you're blind to what it looks like. I tend to take a pretty common-sense approach to defining intelligence. A lot of it has to do with adaptation to your environment, being able to learn, being able to problem-solve, reasoning, being able to learn from your mistakes, and also being curious. I include intellectual motivation and engagement as part of my definition of intelligence. But… I don't think we need to overvalue intelligence. Let's just say intelligence is one characteristic, one thing out of many things. Just like anything in life, everything's an interaction between nature and nurture. I just want to give all kids all the opportunities for intellectual enrichment that we can, without prejudging their ultimate intellectual potential.

CX *I love that answer. I think not being afraid of saying that things are hereditary or genetic is really important in this conversation. What can you say about whether or not these qualities are innate? Can we improve them? What's the relationship there?*

SBK One of Turkheimer's laws of behavioral genetics is that every psychological trait has a heritability coefficient. So partly nature, partly nurture. It's uncontroversial in realms such as introversion/extroversion. Is anyone getting upset when you say introversion/extroversion is influenced to some degree by your genes? Everyone knows there are some people who are curmudgeons. It's not like anyone taught them—they were born out of the gate with this temperament. And likewise, there are some of these kids aged two or three, they're soaking up knowledge like crazy. These gifted kids—they exist. We don't need to make everyone else feel good about themselves by denying that they exist.

But when it comes to how much we can grow and learn and change… I believe in the potential for growth for anyone if they're motivated. And genes influence your motivation for these things, too. Those who soak up knowledge like a sponge are going to be more motivated to keep soaking up knowledge like a sponge. Those who find it extremely difficult to remember anything or learn anything might not be as excited to keep doing that. I worked on this model with Angela Duckworth: high-level achievement is talent times effort. Talent is your rate of learning, rate of development, and effort is time on task, or motivation and engagement on the task. How far you go in life is a function of your rate of development multiplied by time on task and engagement on task. Kobe Bryant was incredibly engaged in basketball because [with] every investment he put into it, he soared. So let's make sure we're also allowing kids to invest in the things that are right for them.

> "…TARGET A LOVE OF LEARNING, THE LOVE OF THE PROCESS OF MASTERY."

CX *So how do we impact those traits? Or, to say that in another way, what are some practical things we can do to make kids smarter?*

SBK I don't know if we can actually make kids smarter. We can inspire them. We can make them fall in love with learning. For a teacher to come and say, "we're gonna make you intelligent"—no, it just doesn't work like that. The number one thing, I think, is to target a love of learning, the love of the process of mastery. Allowing kids to learn that struggle is an essential part of the learning process. We have this attitude these days with kids: the second they're uncomfortable, we placate and coddle them. That's not a way of making them more intelligent.

Even the most intellectually gifted humans in the world are going to face

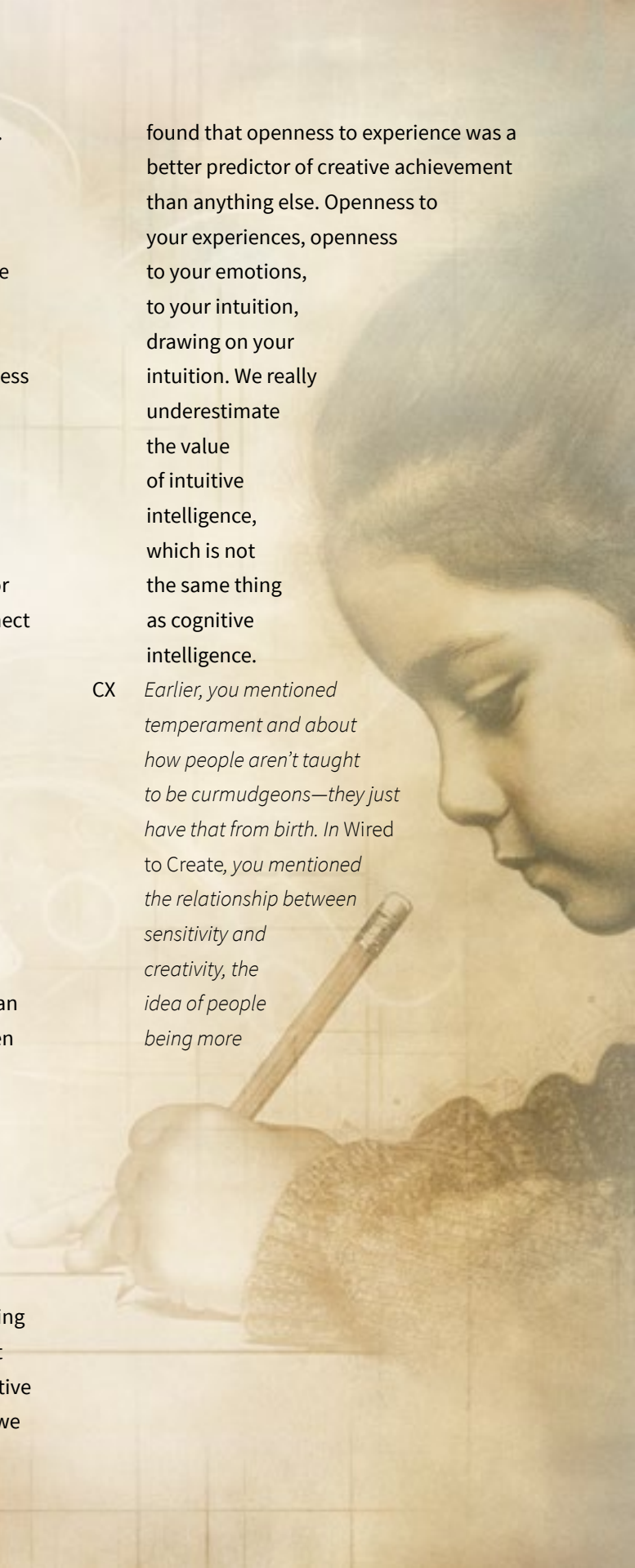
things that are going to challenge them. Einstein struggled with things and had to persevere. So, it really is having them fall in love with the whole process. And, showing the reward that comes from the mastery process—maybe having some project-based reward, where they can demonstrate and have pride in the process they went through. Also, the teacher or the modeler can model enthusiasm. Inspiring mentors are really important; so is showing examples of people throughout history who have changed the world using some of their learning or knowledge. Another way is to help connect the learning material to something that gives them some meaning for what they're doing.

CX *So what about creativity? Is there a relationship between intelligence and creativity?*

SBK That's a very complex question because there are a lot of different forms of creativity. For my dissertation research, I showed that IQ was more relevant to creative achievement in the sciences than the arts. I found zero correlation between IQ and creative achievement in the arts. And that did not just include visual arts, it included things like comedy, creative writing, music, et cetera. And we found that intellectual curiosity out-predicted IQ in the sciences.

So, it's undeniable that abstraction, reasoning, and working memory are going to help you. But intellectual curiosity, at the end of the day, out-predicts for creative achievement. Interestingly, in the arts, we found that openness to experience was a better predictor of creative achievement than anything else. Openness to your experiences, openness to your emotions, to your intuition, drawing on your intuition. We really underestimate the value of intuitive intelligence, which is not the same thing as cognitive intelligence.

CX *Earlier, you mentioned temperament and about how people aren't taught to be curmudgeons—they just have that from birth. In* Wired to Create*, you mentioned the relationship between sensitivity and creativity, the idea of people being more*



sensitive in an emotional sense, but also more sensitive to details in the world. So, are we all wired to create? Is there a temperament or predisposition to create?

SBK Well, "yes and"—there's definitely temperament. No offense to accountants, but I've met accountants who literally have no interest in being creative. And you don't want them to be creative with their accounting; they do what they do very well. You don't want pilots to be too creative in the cockpit. But neurodiversity is important. We all can certainly think of creative approaches, no matter what we're doing. Creativity is a way of life. It's a way of being. It's an attitude towards life. I think anyone can approach life in a more creative way to help them be more resilient. Because no matter who we are, including accountants, we all face lots of hardships. And I think creativity can help us all deal with the givens of human existence in our own ways.

> "... ANYONE CAN APPROACH LIFE IN A MORE **CREATIVE WAY** TO HELP THEM BE MORE RESILIENT."

CX *What can we do, if we should, to try and boost creativity? What can we do to encourage that approach to living?*

SBK I think there's a lot we can do to activate people's creative juices and their motivation. I'm a big fan of project-based learning, a big fan of inspiring people. I think inspiration is an undervalued route to creativity. What we want is not forced grit; we want organic grit. Organic grit comes when you're motivated and you are enjoying engaging in a project. Sometimes it can be as simple as prompts in the classroom that are open-ended as opposed to closed-ended. We can stimulate divergent thinking in the classroom by simply opening up reflection questions that don't have single correct answers. For example: "What are some ways that history could have gone wrong? Or could have gone right?" or "How could we have prevented slavery?" Could you imagine if you're a history teacher, and all of a sudden you get a lively discussion among the students trying to figure it out?…. But let's keep going: "What are some of the systems and structures that were in place at the time?" or "If we could go in a time machine, what systems could we have changed?"

I love generating creative questions for students. And any teacher can do that and it's so much fun. And you're basically prompting students to think creatively and in a way that inspires them to want to make the world a better place, to think about what they could do to create systems that make the world a better place, and how they can contribute. These questions do multiple things: they connect the self to the material, they stimulate divergent thinking, and they show that you appreciate students' creativity, not just the ability to be evaluated for the single correct answer.

CX *What do we know about the role of intelligence and creativity in building a good life?*

SBK There are so many different levels on which to answer that question. So many different levels are correlated with your ability to deal with everyday life. There are a lot of everyday complexities of being an adult that require intelligence—I hate to say it, but it really does. Also having impulse control, self-regulation, and being able to plan for your future. I'm writing a book right now and I'm resisting every temptation in the world coming my way. It's not easy—it's hard! It requires an effort of your intelligence to do such a thing. So, different levels of analysis from dealing with life, problem-solving within your own domain of work, and learning new information. Creativity is absolutely essential for the future. The way I look at it, intelligence is your ability to apprehend what is; imagination is your ability to apprehend what could be; and creativity requires both intelligence and imagination.

CX *So, how do you think we can help kids build a flourishing life?*

SBK That requires going way beyond intelligence and creativity. I teach a course called "The Science of Living Well," and I just have one lecture on intelligence and creativity. But the whole rest of the course [covers] so much of what there is to be human. How can you find your calling, your purpose? How can you cultivate more positive emotions and have resiliency in the face of distraction, in the face of adversity? How can you live with your uncomfortable emotions and regulate them? What it means to live a happy, meaningful life is a different question from the question of how to be more intelligent. It's a much broader question. How do you be true to yourself, live your own lifestyle, and own it?

CX *In this issue, we wanted to go beyond a conversation about intelligence, to try to broaden the definition and add other dimensions. With the concept of flourishing life, you talk about concepts such as awareness, compassion, social action, and responsibilities that come with being connected to a larger group of people. How do these concepts factor in your idea of a flourishing life and how can we make kids smarter in these aspects?*

SBK We underestimate the extent to which our prefrontal cortex evolved due to social pressures in our ancestry. That's probably why we evolved the function of intelligence in the first place—to be able to keep track of our social world. There were drastic consequences for not remembering someone's name in the savannah.

Nowadays, we have the remnants of this, we feel social shame for things we shouldn't. We developed intelligence due to social cognition in a lot of ways because we're such a social species. I think it's

a shame that so many of these IQ tests are so divorced from any social realm or any context. Because we're such a social species, such social animals, I think that intelligence plays a role in being able to apply our reasoning skills, understand the emotions of others, understand our own emotions, and our being able to discern the right thing to say from the wrong thing—being able to have a real open awareness of what is going to lead to your growth, what is not going to lead to your growth, and how to contribute to what sort of calling or skill set is most uniquely suited to you. That will most uniquely create a synergy between you and the world, as Abraham Maslow put it, where what's automatically good for you is good for the world.

CX *In some cultures—for example, in Zimbabwe—it's considered unintelligent if you don't ask for help. In the West, all of our intelligence tests are independent. If you ask for help, you're cheating. So I love the idea of the interplay there and the kind of limitations that we have put on intelligence in that way.*

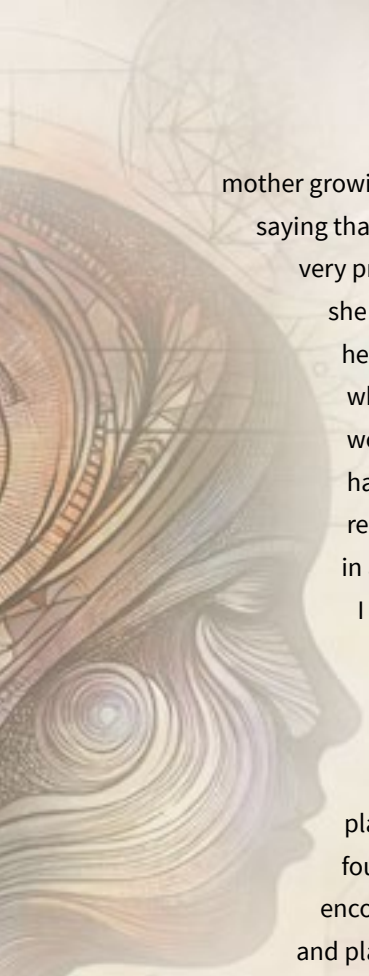
As we push past intelligence as the gold standard and incorporate all of these different things into what smartness is, what role do you see schools playing in building this flourishing life, this smart life for our children? Or, to put it differently: how might we change schools and what structures could we put in place to support that development?

SBK I think changing the culture of the school from a model of strict evaluation to a model of inspiration. We need a huge shift from trying to obsessively capture someone's potential at a moment in time to unlocking their potential over a dynamic process. That's why I redefined intelligence.

My theory of self-actualizing intelligence is the dynamic interplay of engagement and ability in the pursuit of personal goals. When schools are our primary focus, it's more important to focus on self-actualizing intelligence than IQ-intelligence because it'll cast a much wider net. With self-actualizing intelligence, you recognize that every single person in that school has their own unique, sacred journey that they are on of their self-actualizing intelligence. And if you can get their unique intellectual skill set to interact with their abilities in the pursuit of a tangible personal goal, then—if you're lucky—some of these kids will catch fire in their lives with who they want to become.

CX *You hinted at this, but what about parents? Are there any general nuggets you can give about how we help parents to help their children develop this flourishing life?*

SBK There's all this research on what optimal parenting requires. It's usually a balance between authoritarianism and freedom…. There's a healthy balance between the two. Creating really strict, firm, basic values in the household is very important, but also giving kids the freedom to explore and the freedom to grow. I had an overprotective



mother growing up. I always feel guilty saying that even as an adult. She was very protective. That was the way she knew to love; I'm not faulting her. But it created a dynamic where I was very scared of the world for a while and didn't have the skills to function. I remember the first time I was in an elevator as an adult alone. I had a panic attack because I didn't know how to function in the elevator. So, I think it's really important to give kids the freedom to play and to roam. With a safe foundation, of course, but encouraging: "Get out, get out and play. You don't need us all the time!"

CX *Artificial intelligence has rocked education in many ways. What role do you think AI might play in making kids smarter, more creative, or even happier in their lives?*

SBK I think that there's great potential for AI to help with self-paced learning, allowing students, without such pressure, to meet the standard rate of learning as everyone else, with really good adaptive approaches to learning, with really good feedback. Automatic feedback saves a lot of teacher headaches, and students can get some additional support at home, fostering greater connections between parents and students throughout the day, and allowing students to do more projects and create portfolios that carry them around throughout the years.

The sky's the limit in terms of what AI can do — we're only limited by the human imagination. Of course, there are also potential challenges. There are always pitfalls that come with a mechanical approach to something that strips the humanity and real heart of an intimate connection. The teacher providing a human touch is essential for the learning process and I think always will be. Ed

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MISTAKEN BELIEF

Intelligence *is just* one thing *and the* IQ test *is its* best measure.

THE FACTS

Being smart is more than being IQ-intelligent.

Researchers use a precise and narrow definition of intelligence, or IQ, but the more colloquial use of "intelligence" is far broader, meaning something closer to "smart." The precise definition of IQ—or general intelligence (g-factor)—used by researchers is a single construct that refers to cognitive ability and IQ tests can validly and reliably measure that. However, there are other contributing factors to a person's potential or capability beyond IQ-intelligence, such as problem-solving, critical thinking, creativity, and curiosity. IQ is only one of a multitude of factors that impact students' academic success, life success, or even the ability to think—otherwise known as "being smart." IQ tests do not measure this multitude of factors.

THE Compassion Learning Spiral

A CASE STUDY ON HOW STUDENTS DEVELOP COMPASSION

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Many schools view compassion as a core value and hope to nurture compassionate action within their students and faculty. We see evidence of this hope demonstrated in schools' mission statements and operational plans; many schools have adopted programs to help situate social and emotional skill development as one of the key pillars of their institutions.[1] Yet, if we don't know how compassion develops as a skill, how many opportunities are we missing to cultivate compassion in everyday life? If we understand how students develop the key social-emotional skills needed to enact moral values such as compassion, we can construct learning environments that bolster those skills and values.

Compassion is a sense of concern for the suffering of others and an aspiration to see that suffering relieved.[2] The generation of compassion is dynamic and involves both cognitive and emotional factors,[3] as well as an appraisal process.[4] In this study, by asking students to reflect on compassion and describe their own experiences, we mapped out a common learning pathway that many of the students followed as they engaged in situations that offered an opportunity for compassionate action.[5] Our goal was to understand the common processes through which young people learn to be compassionate,[6] so that educators can intentionally support those learning pathways. In addition, we

aimed to identify obstacles that were commonly encountered when students were learning to be compassionate.[7] The insights from these children are inspiring, and teachers, school leaders, and parents stand to benefit from the wisdom and guidance they shared.

> *"If we understand how students develop the key social-emotional skills needed to enact moral values such as compassion, we can construct learning environments that bolster those skills and values."*

Our partner school for this study was a bilingual English-Spanish school in Ecuador that includes a preschool, a primary school, and a secondary school. The school serves primarily native Ecuadorian students but also includes students from approximately twenty nationalities. Most students are from families with middle or high socioeconomic status. The school uses a program that strives to instill six pillars of character education: trustworthiness, respect, responsibility, fairness, caring, and citizenship.[8]

In this study, we used the Biblical story "The Prodigal Son"—which focuses on compassion and is well known in Ecuadorian culture—as a prompt to help students think about different aspects of compassion and relate those aspects to their own experiences.[9] The interview questions explored students' thoughts about and experiences with compassion.[10] For example: How did each student describe their understanding of compassion? What led to each student's decision to take compassionate action or not? How and why did each student decide who deserved compassion?[11]

Our analysis (Supplement 1) of the students' responses revealed a map of the most common learning pathway in the development of compassion, which we have named the Compassion Learning Spiral (CLS). This learning pathway was shared among most participants, regardless of

age and gender (Supplement 2). The CLS comprises four transitional stages—recognition of suffering, evaluation, action, and unfolding—that students move through when developing compassion as a skill. The CLS is best viewed as a reiterative cycle that students go through continuously and expansively as they grow or wane in their capacity to enact compassion.

Figure 1. The Compassion Learning Spiral (CLS).

Compassion Learning Spiral and Its Learning Pathway

The four transitional stages in the CLS are: 1) the recognition of suffering, 2) evaluation, 3) action, and 4) unfolding. Each of these four stages displayed aspects of cognitive, affective, motivational, and attentive processes, which is consistent with a multidimensional conceptualization of compassion.[12] For example, students described how they engaged in cognitive processes to determine if they needed to take compassionate action while simultaneously naming the emotions they associated with the individuals they were considering helping.

For most students, the transitional stages operated in a self-perpetuating spiral through which positive experiences expanded students' capacity for compassion. This growth occurred during all four transitional stages, with students experiences encouraging complex, empathetic, inclusive, and expansive skill development. Likewise, negative experiences at any of the transitional stages could stall the development of compassion as a skill and, in some cases, decrease students' capacity or willingness to engage in compassionate action in the future. In this way, experiences at each stage of the CLS can either enhance or inhibit the development of compassion.

First Stage: Recognition of Suffering

The first stage of the CLS is the ability to recognize suffering. In our study, this was a prerequisite to the generation and expansion of compassion.[13] This stage was directly related to the attention or awareness aspect of compassion,[14] as well as moral decision making, which encodes cues that include emotion recognition and attention.[15] A 10th-grade student provided a thoughtful description of this stage in their definition of compassion:

> *Always wondering what your friend is doing… maybe, watching [a friend], knowing when he needs your help, always knowing what to say to him.*

This student's definition of compassion implicitly assumed that one must be able to recognize suffering to act compassionately by directing their attention towards others. Another student defined compassion as "when someone is in trouble, and you are willing to help." Similarly, a different student described compassion as "when another person

has problems, and you care for and help them." In each of these statements, acting compassionately implicitly required recognizing "trouble" or "problems."

Further, when students were asked to describe an experience of giving or receiving compassion, many indicated there was recognition of physical and/or psychological suffering. For example, one student's compassionate experience began when they witnessed a classmate crying because they had "fallen and hurt themselves" while another student's compassionate experience started toward a classmate who "got in a fight with her parents and was lonely and sad."

> *"... the ability to recognize suffering ... was a prerequisite to the generation and expansion of compassion."*

We asked students to describe a time when they did not act compassionately toward another person. In many of these responses, students did not recognize the other's suffering, leading them to decide that compassionate action was inappropriate for the situation. For example, one student said:

> *I would not have compassion for a criminal in jail that does not feel bad or repent for his actions… and that thinks that what he did was right.*

This student struggled to recognize suffering in the absence of remorse. Another student insightfully discussed how their own suffering could be a barrier to the recognition of suffering in others and could inhibit their ability to take compassionate action:

> *Obviously in some cases you feel more compassion than in others.... When I have a lot of my own problems, I'm just thinking of me.*

I'm not able to think of showing compassion to others while I am suffering.

This highlights that a student's ability to direct cognitive, affective, and motivational capacities toward the recognition of suffering is a prerequisite for the generation of compassionate action. In fact, in many of the examples of non-compassionate action in our study, there was a lack of recognition of suffering.

It may be particularly important to cultivate the recognition of suffering in students from relatively higher socioeconomic status. Previous studies found that students from higher socioeconomic backgrounds underestimate distress and suffering more frequently and present lower levels of dispositional compassion than those from lower socioeconomic backgrounds.[16] We need to explore how we can support all students to become more sensitive to suffering.

Second Stage: Evaluation

The second stage of the CLS, *Evaluation*, describes the set of appraisal processes individuals undergo after they recognize suffering. In this stage, students analyzed the situation of the individual who was suffering and decided whether or not compassionate action was appropriate. This transitional stage relates to three elements of compassion: understanding the universality of suffering in human experience, feeling empathy for the individual who is suffering or connecting with the other's distress, and tolerating uncomfortable feelings in response to the suffering individual.[17] While some evaluation processes can lead to compassionate action, others may lead to non-compassionate action.

> *"A compassionate experience is influenced by an individual's appraisal of the costs and benefits to the self."*

A compassionate experience is influenced by an individual's appraisal of the costs and benefits to the self.[18] There are three considerations within the appraisal process: How relevant is the suffering person to us and our goals or ideals? Does the person deserve the negative outcome? And finally, is the person able to cope with the situation without considerable costs?[19]

In our interviews, several students described assessing whether or not it was safe to intervene in certain situations. This type of evaluation informed their choice of compassionate or non-compassionate action. When asked to think of a situation when they would not have compassion for someone, a 10th-grade student responded:

> *If I'm walking on the street and I see someone that looks like a thief or something, I would not help them. I would just go, to protect myself.*

We asked a 7th-grade student to recall a situation when someone they did not know was crying or was suffering. The student responded:

> *I just felt sorry for them, but they could be dangerous. Someone could try to steal from you if you try to help them.*

In these cases, the students evaluated the given situation and determined that the cost of compassionate action might be too high; they chose not to take compassionate action since these situations might pose a danger to themselves. Compassion increases when a person feels they have the material and psychological resources to cope with the given situation without significant costs to the self.[20] There were also

instances in which students evaluated the level of proximity or similarity that they perceived between themselves and others. For example, when a 10th-grade student was asked if they would react differently if the person suffering was a friend or family member rather than a stranger, the student responded:

> *If it was a family member or someone close to me, then I would definitely go [help], no doubt.*

> *"...not knowing the person who is suffering can elicit non-compassionate responses such as not reaching out, feeling sorrow without taking action, and admitting to not caring about the other."*

Here, the student's evaluation of closeness to the suffering person is a factor in their willingness to provide help.

On the other hand, another 10th-grade student was asked whether they would show more compassion toward someone who is from the same country than to someone who is from a different country. The student explained:

> *No, because they are the same —not the same people, but… they are people! You should help them. Not because they are from your country…. They're still humans…. You're helping society; you're helping other people. You're helping everyone that's there, not discriminating against other people.*

This student's response illustrated an evaluation made by someone whose capacity for compassion has expanded to be more inclusive and universal. This expansion reflects a recognition of their shared humanity, which in turn allows this student to be compassionate.[21]

In the evaluation stage, students frequently cited unfamiliarity or not knowing the suffering individual as justification for non-compassionate action. For instance, a 10th-grader was asked, "Can you remember a situation when someone who you didn't know was crying or was suffering?" The student responded:

> *Many times, I've seen people who were crying who I didn't know or have never seen before. And obviously, something in me says "poor them." And I will wish them the best, but it's not like I will reach out to them or ask them if they need anything.*

In another interview, a 10th-grader was asked why they thought it was hard to be compassionate toward people they didn't know, the student replied:

> *Because you don't feel as identified with them as someone you know or are related to. You just don't feel that sorry for them. Maybe because you don't talk to them that much, you maybe don't know his or her situation.*

In another interview, a 7th-grader was asked why they would react differently to a stranger than to a friend or family member. The student stated:

> *I am not sure, probably because when you don't know him, you really don't know the situation, so you really don't care for him; as a person you try to know if this person needs anything, but you really don't put effort [in] because he is not someone you know.*

These three responses suggest that not knowing the person who is suffering can elicit non-compassionate responses such as not reaching out, feeling sorrow without taking action, and admitting to not caring about the other.

Whether or not the sufferer was believed to have good character or to have deserved their situation also informed the compassionate action of the students in this study.[22] For example, when a 10th-grade student was asked why the father in the Biblical story showed compassion toward the son who returned home, the student suggested:

> *Maybe because he [the son] came ashamed and he [the father] was happy to see him back and they could try again.*

This student believed that if the son felt ashamed, then he was deserving of compassion.

A 4th-grade student was asked how they decided who deserved compassion and who did not. The student offered evidence that there was some type of appraisal mechanism at work, stating:

> *You see their character and see if they are ashamed.*

The same student was then asked if there was anything that someone could do to not deserve compassion. The student responded:

> *For example a robber that doesn't feel ashamed, doesn't deserve compassion.*

This student's response reflects how an evaluation of whether or not the suffering person seemed to deserve their situation can serve as a guiding variable in the consideration of whether or not to act compassionately.

These examples also highlight an integral characteristic of the CLS: the transitional stages inform one another and are ultimately inseparable from one another. Accordingly, the evaluation stage has an effect on the next transitional phase, which is action. For example, when a 10th-grade student was asked what they did when they saw

someone they didn't know who was suffering, the student answered:

> *I just saw him and didn't know what to do … because he was like a random person in the street crying.… I didn't know who he was. He was probably faking, so I didn't do anything. I don't know.…*

In this example, the initial recognition of suffering was offset by an evaluation that the suffering lacked authenticity, resulting in a choice not to take a compassionate action.

Third Stage: Action

Action—the third stage of the CLS—occurs after individuals recognize suffering and evaluate the given situation. In this study, we categorized any action as compassionate if the students said the goal of the action was to comfort or relieve suffering within the self or others. This compassionate action involved delegating attentive, cognitive, affective, motivational processes to relieve suffering. Similarly, we categorized an action as non-compassionate if the goal was not to comfort or relieve the suffering within the self or others. Therefore, not taking any action in response to suffering was labeled as non-compassionate.

A 7th-grade student described taking action to relieve suffering, providing an illustration of compassionate action:

> *I was on vacation, and I saw a little boy who was lost. He couldn't find his parents. And I remember the first time I got lost, it was very frustrating, and the only thing I wanted was for someone to help me, to tell me that everything was all right. But no one came and helped. So when I saw the little boy crying, I saw myself. Maybe he was feeling the same way I felt, so why not help him? I grabbed his hand. He was maybe six or seven. I told him things would get better, there was hope, that everything was all right, and eventually we would be found. We sat down on the bench together.*

This student identified with the experience of the little boy during their evaluation of the situation and connected it to their own experiences of suffering.

Failure to connect with another person and understand their perspective can lead to

non-compassionate action. A 7th-grade student recognized a homeless man's suffering, but during the evaluation process the student determined that man was not deserving of compassionate action. When asked, "Can you think of a situation where it is okay to be non-compassionate towards someone?," the student replied:

> *Like maybe when people are not who you think they are. When I was in Europe there were many poor people, and I was sad for them. I saw this guy asking for money and everybody around me was like no, no don't do it. But I was like, oh that is so sad, so I kept looking at him. But, when nobody was with him in the street, he took out a cigarette and started smoking. I was like whoa, that's not what I thought he was like, he has money to buy cigarettes, it's his own fault he is poor. So I didn't have compassion for him or help him out, and I didn't feel bad about it.*

Many students offered very specific conditions in which they believed it was acceptable for them to not take compassionate action. This evaluation led the students to choose either inaction or non-compassionate action in which they did not seek to comfort or relieve the other's suffering.

Inaction can stall or even halt progression through the CLS cycle, effectively narrowing the situations and circumstances in which an individual can develop compassion as a skill. Non-compassionate action rarely engendered a more expansive motivational, attentive, affective, cognitive, or active orientation toward relieving the suffering of others among the students in our study.

Fourth Stage: Unfolding

The immediate or long-term consequences that resulted from the first three stages of CLS lead to unfolding, the last of the four transitional stages. Unfolding refers to the impact of the compassionate action (or inaction, or non-compassionate action) on the students in the study.

The 7th-grader who acted compassionately in the above example demonstrated the unfolding transitional stage in their final comments. They stated:

> *After we sat down on the bench together, the boy stopped crying. We shared a little about ourselves. We laughed. It was very nice.*

"Unfolding includes all the perceived positive and negative impacts of the action on the self or others."

Unfolding includes all the perceived positive and negative impacts from the action on the self or others. It also includes the lessons that an individual takes away throughout the recognition, evaluation, and action stages of the CLS. Sometimes when people attempt to act compassionately, it doesn't go well. How do they process that, and how does that present an obstacle to their future actions? Most students in our study described an unfolding of positive consequences after performing compassionate actions.

For example, one student described a situation with a peer, recalling:

> *She was crying and I [asked]: What's wrong with you? Then I helped [her]. She hugged me and now we are really close friends.*

In this case, the student described the unfolding by naming the physical sign of affection that was shared and the gain of a friendship. Another student shared an emotional consequence after helping a classmate:

> *I felt happy because I know the person appreciated what I did.*

Students also mentioned that they expected specific outcomes as a result of taking compassionate action. Highlighting how unfolding can impact the affective, motivational, action, and cognitive components of compassion, one student explained:

> *Everyone deserves love or compassion. If you do that, you feel good with yourself. It's helping you; it's helping the one who needs the care, and you feel good with yourself.*

Unpleasant unfoldings could also increase a student's motivation to engage in compassionate action in the future. This was most prominent when students described situations in which they felt their behavior was not appropriate. For example, one student shared:

> *Many times I lied to my parents. I did something I didn't tell them or told them something else. [Then] I felt ashamed, I felt bad for myself, and thought that I shouldn't have done it.*

A 4th-grade student stated:

> *When I raise my voice to my parents, [or] when I fight with my brothers, [or] when I just do something that I wasn't supposed to, [then] I feel badly and do not want to do that again.*

The same student explained how this unfolding determined their actions afterwards:

> *When I fight with my brothers, I [will] talk to them, I say I'm sorry. To my parents also, I try to apologize.*

Finally, a 7th-grade student mentioned:

> *One time, I got in a big fight with all of my friends. I was mean to them. That's why I felt bad. I decided to change. See my errors, learn how to change, how I need to be.*

In this student's experience, unfolding led to an increased motivation to be compassionate, even when the student had originally chosen non-compassionate action.

Students in our study also mentioned how an undesirable unfolding can diminish the generation of compassion toward others in future situations. For example, one student said:

> *If I had previously helped or tried [to help someone], and that person wasn't nice when I tried to help her, then I wouldn't give it another try.*

When another student was asked, "How do you decide who deserves care and compassion and who does not?" they responded:

> *I think everybody does [deserve compassion] until they do something to prove they don't.*

Some students suggested that negative unfoldings did not always impede future opportunities for compassionate action. For example, one student shared:

> *Parents, such close family, will always love you, no matter how evil or bad you've become. A mother or father would never like to see his son being judged in the wrong way, or not being shown compassion.*

It is worth noting that students referenced this type of unconditional compassion only when referring to the parent-child relationship. Together, these statements illustrate how unfolding conditions can either compromise or promote the development of compassion.

Practical Applications

A better understanding of the different stages of the CLS enables us to draw a clearer picture of how compassion develops. The table on the following page includes a few concrete ways that educators and families can put the CLS to use in young people's everyday experience to help them develop compassion.

DEVELOPING COMPASSION

SHARED UNDERSTANDING

Bring everyone on board. Introduce faculty, staff, and caregivers to the stages of the CLS and invite them to reflect together. When all members of a school community work together, using a common language and a shared understanding of compassion, there is a greater chance of initiatives succeeding.

PRACTICE AND REFLECTION

Look outside the classroom. Opportunities for students to practice and reflect on compassionate action can happen throughout the day in the halls, cafeteria, stairwells, at home, and in other public places.

CULTIVATING AWARENESS

Invite students to become better at recognizing suffering by engaging in daily journaling, with the goal of becoming more attuned to recognizing suffering. Encourage students to name the emotions involved—their own and others'—through direct feedback.

EXAMINING COMPLEXITY

Emphasize learning moments where choices to act are difficult to make. Use dilemmas and case studies to practice the evaluation stage of the CLS with students in a low-risk format.

GROUP EXPLORATION

Expose students to various fictional and nonfictional stories with characters who take compassionate actions or refrain from doing so. Engage students in examining how events in these stories unfolded and encourage them to reflect on how they might act in similar situations.

MODELING

Model compassion directly. Seek out opportunities to practice compassion yourself and share the triumphs and failures that you yourself have experienced when engaging in the CLS. This can help normalize and cultivate the development of skills like compassion in students' everyday lives and can underline the need for consistent practice and reflection.

Supplement 1

We analyzed the students' interviews using grounded theory with inductive, iterative, and comparative methods[23] by using an emic (bottom-up), and then etic (top-down, theory-based) coding process.[24] In order to establish inter-rater agreement and reliability, each member of the coding team first independently listened to the audio recording while taking note of the trends and their impressions on a written transcript of the interviews. Next, we discussed each observation, identified common trends, and constructed several different ways to categorize the trends into codes. These discussions were audio-recorded.

After reviewing all the interview recordings and transcripts, we arrived at an emic coding structure that best reflected the most common conceptual trends that emerged from each interview. Each conceptual trend within the coding structure that emerged from these discussions had aspects of attentive, cognitive, affective, and motivational processes, aligning with the multidimensional definition of compassion. In other words, one could not singularly define a theme as cognitive, affective, motivational, or attentive; the four processes appeared to be interwoven into each theme and dependent on one another.

The results of each emic coding session were summarized in a memo. Each memo included a general overview of the student, descriptions and examples of the potential codes observed, and counterexamples. Once all the emic coding themes were identified, they were listed in a codebook. We then carried out etic analysis of the interviews to settle on a final list of codes. We explored the relationships among each code and mapped them to identify potential learning pathways. In this analysis, we looked for the stages and barriers that the students experienced as they reflected on compassionate action and related it to their own lives. The results of this step of the data analysis uncovered a progression through the codes, which resembled transitional stages that corresponded with the students' recollections of their compassionate or non-compassionate experiences.[25]

Supplement 2

We conducted this study in a particular school setting within a specific cultural context. The findings may therefore have limited generalizability to other contexts. Furthermore, the prompt that was used for the interviews, "The Prodigal Son," introduces certain Christian values and biases about the nature of compassion that could have influenced student responses. Still, since the CLS is informed by previous research,[26] as well as by the results of this study, we hypothesize it may have relevance in other contexts as well.

Further research is needed to explore the CLS in different contexts. Moreover, students often follow different learning pathways depending on various factors.[27] While we did not find different learning pathways based on age or gender in this study, it is possible that the learning pathways of students in other contexts vary based on these or other characteristics.[28] We encourage further research into how the learning pathways students follow in the development of compassion may vary based on various factors in different contexts. Ed

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Endnotes

1. Programs such as Caring School Community and Facing History and Ourselves aim to nurture compassion.

2. Geshe T. Jinpa, "Compassion Cultivation Training (CCT): Instructor's Manual" (unpublished manuscript, 2010).

3. Katrin Preckel, Philipp Kanske, and Tania Singer, "On the Interaction of Social Affect and Cognition: Empathy, Compassion and Theory of Mind," *Current Opinion in Behavioral Sciences* 19 (2018): 1–6, https://doi.org/10.1016/j.cobeha.2017.07.010; Tania Singer and Matthias Bolz, *Compassion: Bridging Practice and Science* (Leipzig: Max Planck Institute for Human Cognitive and Brain Sciences, 2013), http://www.compassion-training.org/.

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5. In this study, we followed the Research Schools International model, in which researchers carry out school-based research with direct practical relevance. Researchers from Harvard Graduate School of Education and Universidad San Francisco de Quito partnered with a school in Ecuador. To learn more about the Research Schools model, visit Research Schools International's website at www.researchschoolsinternational.org.

6. All participants were bilingual students (n=60) who had been at the school since three or four years of age. Among students who met those criteria, we randomly selected twenty 4th-graders, twenty 7th-graders, and twenty 10th-graders to participate in the interviews. A representative from the school oversaw the randomized selection. The sample had an equal number of males and females. Parents of students who were selected to participate signed an informed-consent letter that authorized their children's participation in the study.

7. In order to address these questions, we carried out interviews with students aged 9 to 17 at an independent school in Ecuador. We used qualitative analysis to find common themes and patterns that could be generalized into a learning pathway. For more information on our approach see Kurt W. Fischer and Thomas R. Bidell, "Dynamic Development of Action and Thought," in

Handbook of Child Psychology: Theoretical Models of Human Development, 6th edition, eds. Richard M. Lerner and William Damon (Hoboken: John Wiley and Sons, Inc., 2006): 313–99.

8. "The Six Pillars of Character," Drake University, The Robert D. and Billie Ray Center, accessed August 23, 2023, https://charactercounts.org/six-pillars-of-character-5/.

9. We adapted a story well known in Ecuadorian culture, the Prodigal Son (Luke 15:11-32), so that students would be familiar with the plot of the story. The central theme in the Prodigal Son story is compassion, making it a strong prompt for the purposes of this research study.

10. We used developmentally appropriate interview protocols, with versions in English and Spanish.

11. The interview protocol was divided into four sections. The first section included introductory questions that asked students to provide their own definition of compassion. This section also asked questions that required the students to reflect on how language affects their expression of compassion, care, love, and other emotions. The goal was to introduce the topic of compassion, elicit students' working definition of compassion, and explore their understanding of compassion. The second set of questions invited students to reflect on the experiences of the characters in the story and their own personal experiences. Questions addressed topics such as giving compassion, receiving compassion, evaluating situations, and describing obstacles to compassionate action. The third section included questions that invited students to explore the situations and conditions in which they did not act compassionately. Finally, the fourth section asked students to explain the perceptual rules that governed their expression of compassion toward others, as well as to explore their ideas about familial, local, national, and global citizenship in relation to compassion. Each interview was approximately thirty minutes long. The interviewers took notes throughout, and the interviews were captured by audio recording. The audio recordings were later transcribed and translated to English for data analysis.

12. Jinpa, "Compassion Cultivation Training"; Beverley Garrigan, Anna L.R. Adlam, and Peter E. Langdon, "Moral Decision-Making and Moral Development: Toward an Integrative Framework," *Developmental Review* 49 (2018): 80–100, https://doi.org/10.1016/j.dr.2018.06.001.

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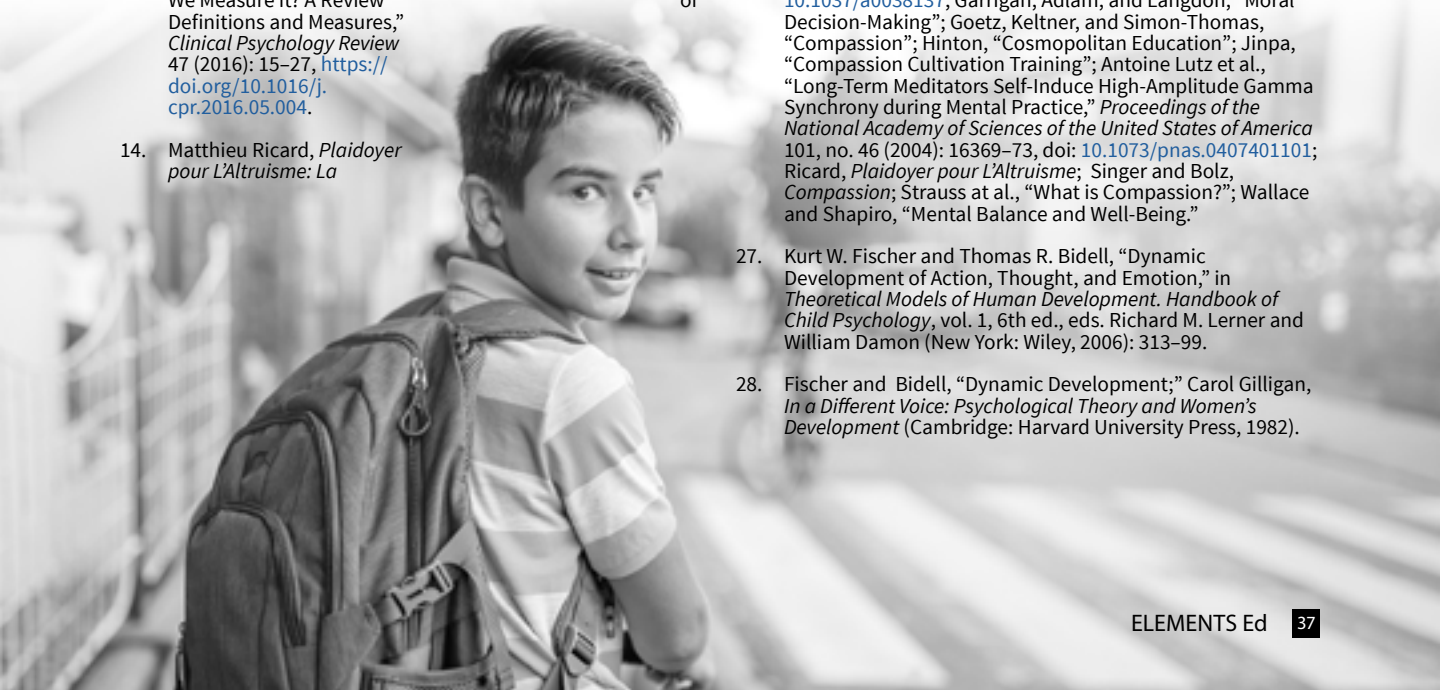
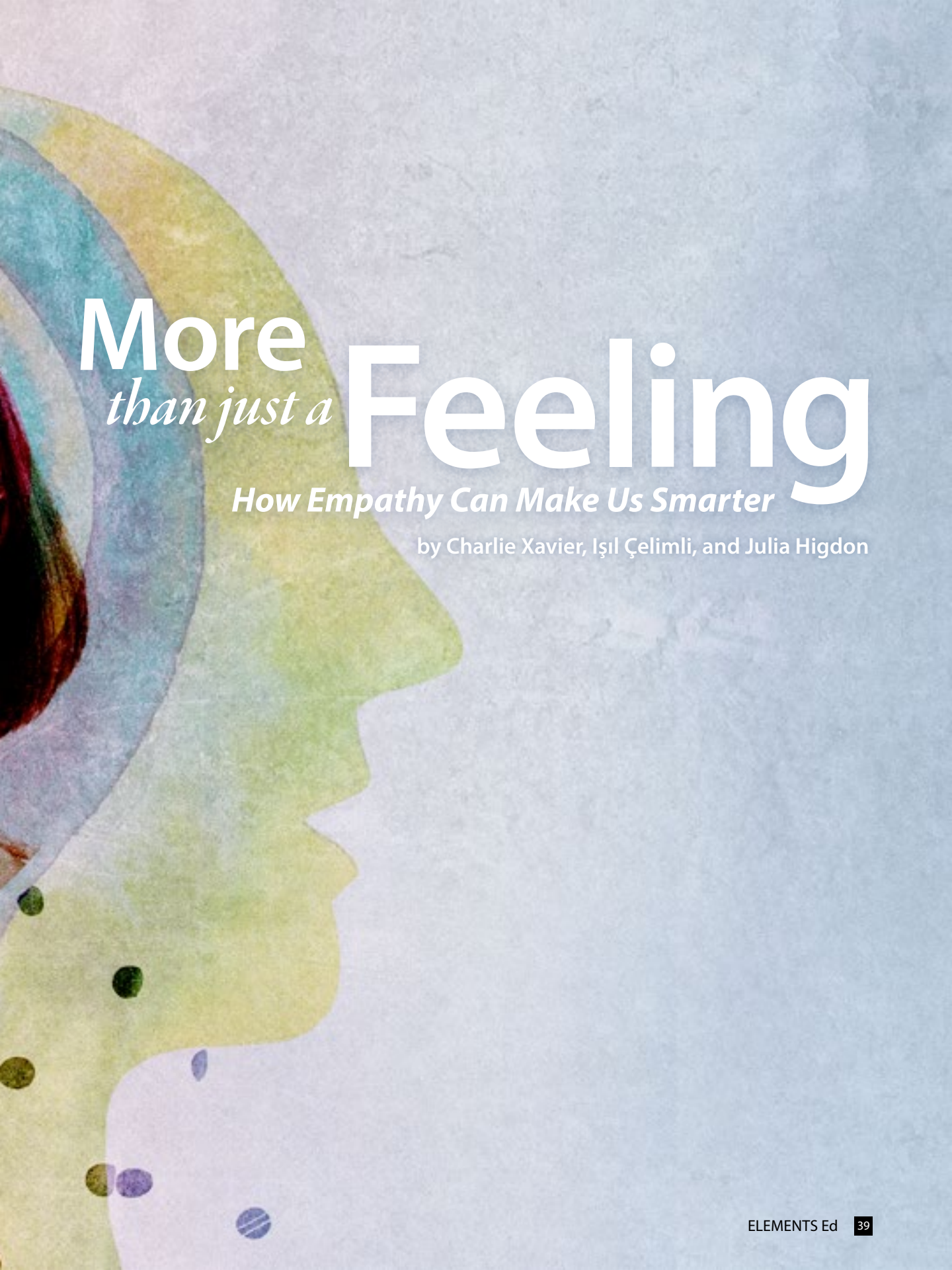




More *than just a* Feeling

How Empathy Can Make Us Smarter

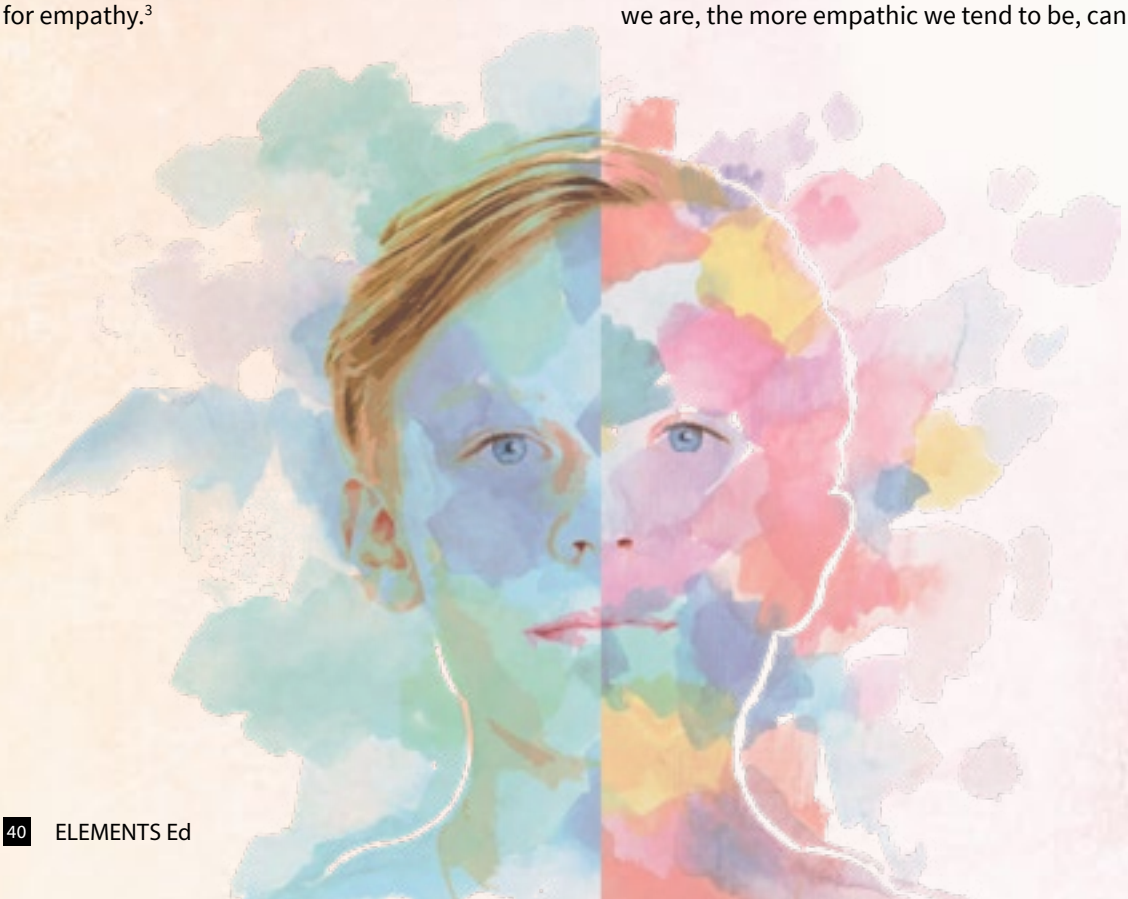
by Charlie Xavier, Işıl Çelimli, and Julia Higdon

> ***If you can learn a simple trick, Scout, you'll get along a lot better with all kinds of folks. You never really understand a person until you consider things from his point of view, until you climb inside of his skin and walk around in it.***
>
> Atticus Finch in *To Kill a Mockingbird* (1962)

Empathy is the ability to put oneself in others' shoes, understand their perspectives, and feel their emotions.[1] Empathy has the potential to bond us to one another; it is a glue that helps establish and maintain meaningful social relationships and a fuel that leads people to take action that alleviates pain and suffering. Everyone has a natural propensity for empathy. But, interestingly, research studies have shown a relationship between empathy and intelligence. For example, highly intelligent children are more sensitive to emotional cues and are better able to make sense of others' thoughts and feelings.[2] Studies also show that the development of cognitive abilities, such as executive functions and language, lead to an increased capacity for empathy.[3]

If we subscribe to a broader understanding of intelligence—one that "reflects a broader and deeper capability for comprehending our surroundings, 'catching on,' 'making sense' of things, or 'figuring out' what to do,"[4] rather than one based in academic achievement or success on tests that measure cognitive ability—then it becomes clearer why empathy and intelligence are so intertwined. When we are better able to understand what is going on around us, it becomes easier to put ourselves in others' shoes—or at the very least, to understand others' perspectives.

One wonders, though, if the relationship between empathy and intelligence is a one-way path. If we already know that the more intelligent we are, the more empathic we tend to be, can we



also infer that the more empathic we become, the smarter we also get? In other words, can empathy make us smarter?

Good news: the answer is yes. We already know that, in addition to being a cognitive capacity, empathy is also a skill that can be improved. Through deliberate practice, we can learn strategies of perspective-taking, imagine ourselves in situations that we do not necessarily experience first-hand, hypothesize forms of actions in response to different scenarios, and eventually become more empathic. And being more empathic allows us to better make sense of the social world.

> *...in addition to being a* **cognitive capacity**, **empathy** *is also a* **skill** *that can be* **improved.**

Is Empathy Just a Feeling?

Empathy is not just a cognitive skill; it is also an emotional response, and without one or the other, empathy would be limited in guiding our actions. Some scholars who have narrowly defined empathy as the capacity to feel like another claim empathy is limited because feelings cannot be reliable guides for moral reasoning. For example, in *Against Empathy*, Paul Bloom rejects empathy as a guide to moral action and claims empathy often leads people to biased and misdirected action.[5] Empathy is "like a spotlight," he writes, "directing attention and aid to where it's needed.… But spotlights have a narrow focus."[6] For Bloom, empathy is biased toward people who are like us, favors individuals over groups, and is impulsive.

Bloom admits his concept of empathy does not include understanding the other's perspective through logical reasoning. And yet he rejects the adequacy of what researchers have called "cognitive empathy" for moral guidance. He states that while cognitive empathy may help guide human action more generally, its guidance is neutral from a moral perspective. To highlight this distinction, Bloom notes that con artists and psychopaths are likely to have high levels of cognitive empathy while clearly not acting morally.

As an alternative to empathy, Bloom proposes "compassionate rationalism" as a more suitable guide to moral action. Compassionate rationalism is independent of our capacity to feel for others; it is instead a considered, thoughtful stance that is rooted in our moral duty to others. To improve compassionate rationalism, he argues that people need to study right and wrong so that they may effectively use their rational thinking abilities, leading to compassionate behaviors. For Bloom, compassionate rationalism mitigates the biased and often impulsive nature of empathy since it enables people to make studied and informed moral decisions.

There is evidence to support Bloom's thinking that empathy does not serve well as a moral compass. In a recent study, Elizabeth Simas and her colleagues looked at how the degree of people's empathy changes depending on whether the direction of empathy is toward members of groups they identify with or not.[7] Using data from a national survey as well as an experimental design, people who scored high in empathic concern showed greater partisan bias in political contexts. The authors conclude that "people tend to display more empathy toward ingroup members and are more sensitive to perceived harmful behaviors

committed by outgroup members"[8] and, therefore, that empathy increases tribalism, or the preference for in-group members. Interestingly, another of their findings is that people who self-reported higher empathic concern are also more likely to be comfortable with contact with out-group members. This suggests that while empathy may increase intergroup polarization, it may also open a door for interactions between groups. These interactions can eventually make way to more understanding of different perspectives and help nurture empathy.

Acting on emotion often leads to biased, impulsive behavior, which prevents people from making smart decisions. However, empathy itself is more than biased and impulsive behavior. Defining empathy as an affective, emotional response that does not involve cognition ignores a large body of behavioral and brain research that shows how emotions and cognition are intertwined and explains how these processes work together to inspire action. Compassionate rationalism cannot and should not exist independently of our capacity to feel for others. Proposing that a studied compassion should replace empathy disregards the power of emotions in triggering action and is antithetical to our understanding of human cognition.

Dual-Processing Theory

Dual-processing theory is a helpful framework to understand human cognition.[9] In this theory, human cognition relies on a combination of two types of thinking. The first type is quick, reactive, and more emotional, while the second type is slower, rational, and more deliberate. The relationship between ingrained, emotional reactions and deliberate cognition is not "either/or," but rather "yes, and"—and empathy includes both processes. Limiting empathy to an emotional, quick, and impulsive response disregards the slower, deliberative aspects of empathy and, more importantly, disregards that the two processes work in combination. When we are being empathic, we are engaged in both thinking processes. We are not only having an instinctual and emotional first reaction, we are also using cognitive skills. It is a naive recommendation to separate the two processes, favoring only deliberation and ignoring the emotional trigger that initially captures our attention and acts as an impetus for action.

Robert Sapolsky, a prominent researcher who has spent decades studying biology and neuroscience and is the author of *Behave*—the seminal book on the evolutionary understanding of why we behave the way we do—takes this as a

given: "both cognitive and affective components contribute to healthy empathic states; it's silly to debate which is more important; what's interesting is seeing when one predominates over the other."[10] In other words, even if we could separate the emotional parts of our decision-making from the cognitive parts (and vice versa), we shouldn't want to do this. This is illustrated by what happens when the regions of the brain primarily responsible for letting emotions influence decisions, or letting rationality influence decisions, are taken offline.

People botch their decisions when rationality is taken offline. Decision-making becomes short-sighted, reactionary, and impulsive without rationality. Damage to the area of the brain primarily associated with deliberate, utilitarian reasoning results in difficulties switching strategies during a task, bad planning, poor control over one's behavior, and difficulty taking someone else's perspective.[11] Another study found that when this brain region was rendered temporarily offline while participants played an economic game, they would accept unfair offers impulsively with the hope of receiving better ones in the future. Interestingly, this effect only persisted if the participant thought the other player was another person and disappeared when they believed they were playing with a computer.[12] This shows that without deliberate, rational cognition, people overemphasize social aspects and proceed to make bad decisions.

Fewer of us see the other side of the problem. Many decisions are inherently social and emotional when observed in nature. Damage to the area of the brain primarily associated with modulating the impact of these emotional reactions on decision-making and behavior results not only in trouble with actually making decisions, but also in bad decision-making. People with damage to this area of the brain choose the wrong friends and fail to adjust their behavior based on negative feedback.[13] In other words, without the proper influence of emotions, we lack nuance and grace in our social decision-making.

Further research shows that when this brain region is rendered temporarily offline, intelligence, working memory, and other purely cognitive tasks remain at full force;[14] however, decision-making becomes extremely utilitarian, with participants being more willing than is typical to sacrifice one family member to save five strangers.[15] Participants in this study were fully able to understand all the options in a given social decision-making scenario and proffered wise advice about how others should act in that situation. However, as the scenario became more personal—and closer to their emotional selves—they had trouble making any decisions at all.

> "**Emotions** *are an important* **call to action...** *they help us make* **better decisions** *when we can recognize and manage their influence.*"

As it turns out, we don't actually want emotionless decision-making, even if it were possible. Emotions are an important call to action in making decisions and they help us make better decisions when we can recognize and manage their influence. What is important is understanding the role of modulating emotions and building that skill when making decisions. When we take this view, it

leads us to better recommendations that are more likely to be effective in cultivating moral actions and leading to more people making better decisions.

Cultivating empathy

Empathy increases naturally with age.[16] As individuals gradually move away from a self-oriented view of the world to one that includes others, their concern for others—and their capacities for understanding and perspective-taking—grow, thus increasing affective and cognitive aspects of empathy.[17]

Empathy scholars increasingly agree that empathy is a malleable skill that can be cultivated and improved.[18] For example, reading literary fiction facilitates the growth of the ability to detect and understand others' emotions, as well as to infer and represent others' beliefs and intentions. In addition, deliberate practice—or, practice that is purposeful and systematic, and that requires sustained focused attention with a specific goal in mind—is a promising method to pursue.[19] Deliberate practice of empathic skills focusing on both initial, quick thinking processes and slower, deliberate thinking processes has the potential to mitigate biased, impulsive reactions. This is also a testable approach to building empathy.

Once we recognize that empathy is more than an impulsive feeling, it becomes a crucial skill that makes improving social relations more attainable through deliberate practice or other testable approaches. What is encouraging is that empathy, like other thinking skills, can be practiced, developed, and leveraged to promote action. From initial, quick reactions to the slower, more deliberate cognition and planning, empathy is a skill we need to develop in young people so they can make sense of their world, identify and understand problems, and figure out how to solve some of the pressing challenges we face today. Ed

> "...empathy *like other thinking skills, can be* practiced, developed, *and* leveraged *to promote action.*"

Charles Xavier, an educational neuroscientist and psychologist, has 14+ years of experience as a researcher, teacher, and advocates for neurodiverse student populations. He is the author of the award-winning children's book *Neurofables: Interactive Stories That Build Better Brains: Inclusion*, which leverages the compelling power of story and children's natural neuroplasticity to address and overcome deeply ingrained, prejudicial thinking habits.

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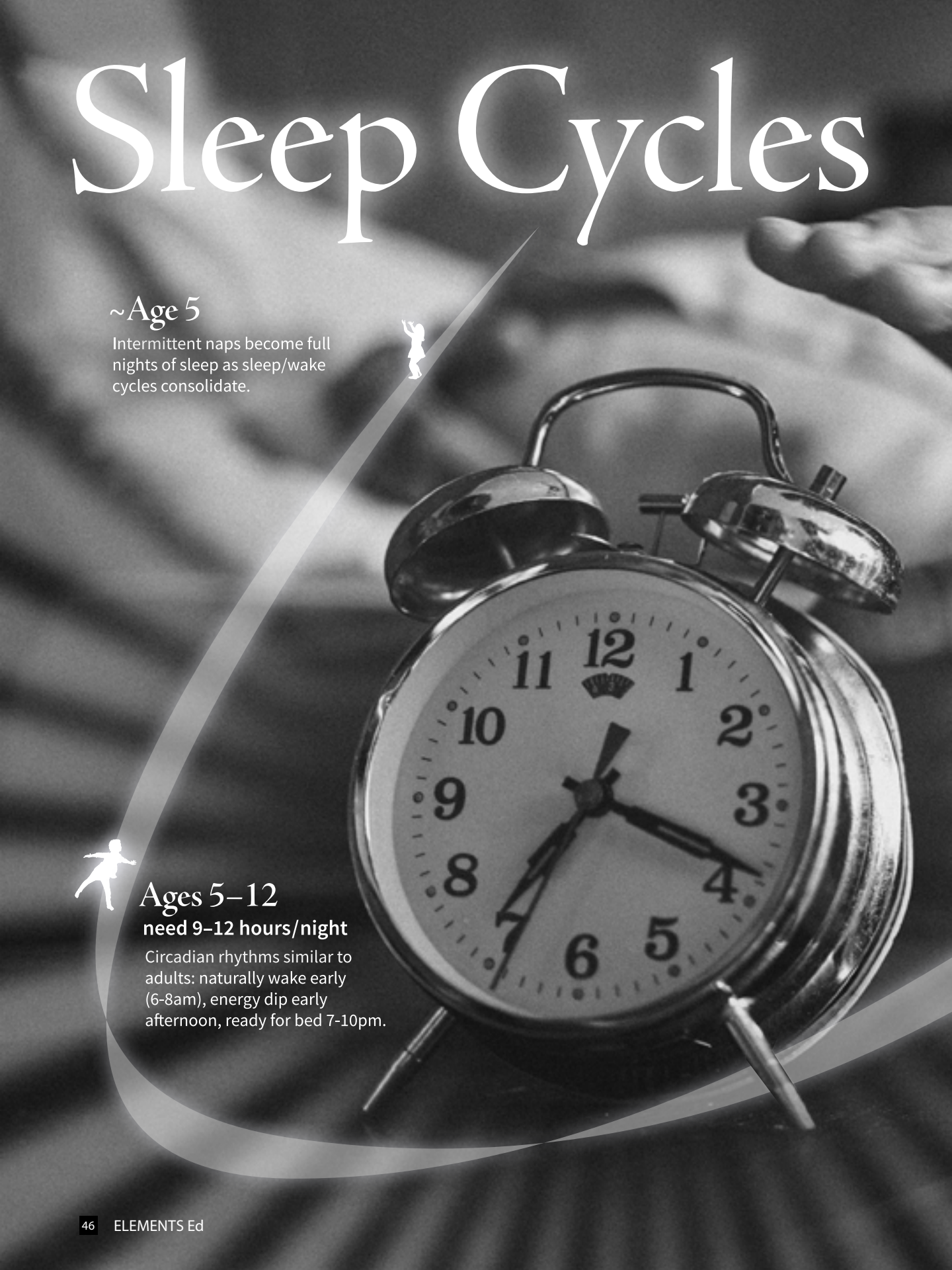
Sleep Cycles

~Age 5

Intermittent naps become full nights of sleep as sleep/wake cycles consolidate.



Ages 5–12

need 9–12 hours/night

Circadian rhythms similar to adults: naturally wake early (6-8am), energy dip early afternoon, ready for bed 7-10pm.

& Cognition

Sleep Deprivation

Impacts include negative effects on attention, focus, decision-making, and memory consolidation (saving new information in long-term memory).

SLEEP-DEPRIVATION CONDITION	BLOOD ALCOHOL CONTENT EQUIVALENT
awake 17 hours straight	0.05%
25% short (e.g. 6 hours sleep but 8 hours needed) for 14 nights	0.08%
awake 24 hours straight	0.10%

legal driving limit is as low as 0.05%

Ages 18–60

need 7–9 hours/night

SLEEP NEEDS BY AGE

Ages 13–18

need 8–10 hours/night

Circadian rhythm shifts later in the day by 3-4 hours, meaning later natural bedtimes and wake times.

Healthy Sleep Strategies

- Keep a consistent sleep schedule.
- Get 5-15 minutes of sunlight after waking.
- Exercise daily—10 minutes is better than zero.
- Do calming activities at night (read, talk, meditate, stretch).
- Keep your bedroom cool, quiet, and dark starting 2–3 hours before bedtime.
- Don't eat within 90 minutes of bedtime.
- Don't caffeinate late.
- Avoid electronic devices within an hour of bedtime.
- Don't rely on weekend catch-up sleep. It doesn't work that way.


“It takes **something more**
than intelligence
to **act intelligently**.”
Fyodor Dostoevsky

MISTAKEN BELIEF

Multiple intelligences — *like* linguistic, logical-mathematical, musical, bodily-kinesthetic, *and* spatial — *are a* thing.

THE FACTS

Not everything is an intelligence.

On the one hand, we place too much value on IQ scores, which oversimplify cognitive ability. On the other, we can't discount IQ by suggesting that aptitude in any specific area can be cast as being intelligent in that area—doing so renders intelligence essentially meaningless. The truth lives in the nuanced middle between these ideas.

The notion that there are multiple intelligences comes from Howard Gardner's widely popularized theory,[1] which often resonates with teachers and parents because it is a positively framed account of individual differences in aptitude. Success in the eight areas of his theory—music, visual-spatial, linguistic, logical-mathematical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic—suggests talent or skill, rather than "intelligences." Not everything is an intelligence, and skills and talents do not need to be classified as such in order to be valuable.

There is no empirical evidence for domain-specific intelligences. An analysis of seven of Gardner's domain-specific abilities proposed as separate intelligences found them to be highly positively correlated with one another. This means that there is an underlying aptitude contributing to success across all of those domains. In fact, "[t]here are no multiple intelligences, but rather, it is argued, multiple applications of the same multifaceted intelligence."[2]

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THINKING PROBABILISTICALLY

IN THE CLASSROOM

BY HANNAH DIAMOND AND JINSOL LEE

Equipping children with strong decision-making skills prepares them to successfully approach and solve complex problems in our modern world. Decision Education—or, the teaching and learning of skillful judgment formation—promotes lasting competencies that children can benefit from well into the future. Thinking probabilistically—a pillar of Decision Education—involves making predictions about future outcomes and then considering the risks, rewards, and consequences of all options in a given decision.[1]

The ability to think probabilistically is critical given children's unprecedented access to an "overload of information."[2] Children require support in learning how to evaluate the reliability of information and detect when information is incomplete or misleading.[3] Furthermore, because many everyday decisions involve uncertainty, it is important for children to be able to understand and utilize probabilistic thinking to make optimal decisions. Research has shown that an inability to do so "can be extremely costly, not only at the individual level but also for society in general."[4] Developmental researchers have also found that children exhibit biases in probabilistic thinking;[5] while the ability to think probabilistically improves with age, adolescents still performed poorly on probability tasks.[6]

Because poor performance on probability tasks is often the product of a lack of relevant skills and knowledge,[7] education is a promising means of improving children's probabilistic abilities. Children who learn to think probabilistically in the classroom can engage comfortably with numbers, identify and address areas of uncertainty in their own knowledge, maximize their chances at achieving desired outcomes, and form well-calibrated judgments based on available information. Promoting the use of probabilistic thinking in classroom conversations supports a culture of intellectual humility and truth-seeking, equipping children with the skills needed to successfully navigate a rapidly changing world.

Using Numbers To Think

Numeracy—or, the ability to understand and work with numbers—is foundational to skillful decision-making. When numbers are involved in a decision situation, "highly numerate decision makers make better decisions than the less numerate."[8] Children who develop comfort with numbers in their youth will benefit for years to come as they encounter more consequential personal, academic, professional, financial, medical, and other life decisions as adults. More numerate individuals are less susceptible to misinformation and emotions that can impair their judgment[9] and are thus better able to engage in clearer decision-making. They consider relevant numbers when making decisions and have a richer, more complex understanding of information.

However, despite the importance of numeracy for skillful decision-making, "even highly educated individuals do not always comprehend numbers when making decisions."[10] Including numeracy as part of the standard educational experience can

have lasting effects on improved decision-making.[11] Numeracy is an answer to students who protest, "why are we learning this?" in their math classes. Of course, not all students will pursue advanced education or a career in mathematics, but being numerate will increase the likelihood that they continue to apply and benefit from mathematical principles throughout their lives.[12]

> "Including **numeracy** as part of the standard **educational experience** can have lasting effects on ***improved decision-making.***"

Teachers can promote numeracy in students by encouraging increased use of numbers in everyday situations. While individuals tend to be more comfortable with and inclined to use words like "possibly" and "maybe" to convey likelihoods, there is tremendous variability in how people interpret these terms. In a survey capturing the extent of this variability, respondents understood "real possibility" to mean anywhere from 20 to 80 percent.[13] Use of imprecise language can lead to misunderstandings and misinformed decision-making.

In order to make this broad range of interpretations salient for students, teachers can provide a list of common terms (such as "frequently," "maybe," "rarely," and so on) and instruct students to assign percentages to them. Displaying the students' responses visually—on a line plot or bar graph, for instance—enables students to reflect on and appreciate the extent of agreement or disagreement in their answers. Teachers can also provide students with specific, relevant examples to contextualize the use of these words. For example, teachers could pose the following scenario to a class: "Your friend says they can probably come to your house after school today. How likely is this to happen?" To scaffold or differentiate this exercise, teachers can start with percentages that might feel intuitive to students—like 0, 25, 50, 75, and 100 percent—and then gradually incorporate more granular percentages as students' comfort level builds.

Establishing a norm of number use in the classroom can increase children's understanding of numbers and their meaning. This practice can also be adopted at home. When children use words to convey likelihoods, parents and caregivers can encourage them to include a percentage. Adults can model this practice for children in their own communication as well, and students can and should be encouraged and empowered to request clarification from the adults in their lives when they use ambiguous words.

Degrees of Confidence

Another variant of the above practice involves providing degrees of confidence—that is, numerical representations of one's confidence in a belief or prediction. This practice encourages individuals to reflect on the information they know and the information they are lacking and then communicate their level of certainty to others. Degrees of confidence are well-calibrated when they accurately reflect the extent of one's knowledge or correspond with the actual frequency of a predicted event.

Research have long stated that well-calibrated confidence assessments are "critical to effective decision making."[14] Overconfident decision-makers may attempt more than they are capable of, may refrain from asking for help, may make riskier decisions, and may "neglect signs that decisions are going awry."[15] Likewise, underconfident decision-makers are more likely to rely unnecessarily on others and to feel paralyzed by hesitation and self-doubt.[16] As children become more independent decision-makers, their ability to assess their confidence accurately is particularly important as it increasingly informs their decision-making process.[17]

Behavioral decision research has

identified a tendency for individuals of all ages to make "poorly calibrated confidence judgments."[18] However, confidence assessments are most poorly calibrated in childhood; by adolescence, accuracy improves, and by adulthood, it stabilizes.[19] This developmental trajectory is reflected in decision-making behavior: adolescents evaluate the advice they receive more thoroughly than children do before choosing whether to follow it.[20]

To incorporate increased number use, teachers can prompt children to express their degrees of confidence as percentages when making estimates and predictions or expressing their beliefs. Students can assess their confidence in predictions about course material (for example: what will happen to the main character in a story) or their mastery of content and readiness for an assignment (for example: how well-prepared they are for an upcoming science exam). The goal is not to express 100 percent confidence, but to reflect honestly about the state of one's knowledge and belief. To encourage the use of degrees of confidence, teachers along with parents and caregivers can prompt students to provide rationales for their stated confidence levels and to identify what information might shift their confidence in either direction. As with other numeracy practices, sharing degrees of confidence can become a norm in the classroom and at home. Children can also track changes in their confidence about a particular matter as new information presents itself, as circumstances shift, or as they uncover new insights based on their existing knowledge. For example, if a student is 75 percent confident that their favorite football team will win the Super Bowl, they might consider how this confidence would change if the quarterback becomes injured. A biology teacher in the Decision Education Teacher Fellowship program, run by the Alliance for Decision Education, found that her ninth-grade students embraced this lesson, regularly providing confidence levels on their own accord.[21]

This metacognitive practice directs students to the gaps in their knowledge, cultivating focused, eager learners who are "hungry for information" to increase their confidence levels.[22] When an individual specifies a degree of confidence, they are implicitly acknowledging that beliefs are nuanced and are rarely merely "right" or "wrong." Expressing confidence helps people embrace, rather than resist, information that challenges their beliefs, "since it feels better to make small adjustments in degrees of certainty instead of having to grossly downgrade from 'right' to 'wrong.'"[23]

From Intuition To Calculation

Skillful decision-making requires individuals to think deliberately, accounting for probabilistic considerations that intuitive preferences often overlook.[24] People have instinctive, emotional responses to the possibility that a desired or dreaded outcome will occur—for example, excitement after purchasing a lottery ticket or fear of an accident when boarding a plane. But these intuitive responses do not account for the (slim) probability of these outcomes.[25]

When weighing decision options, it is natural to favor options that may lead to desirable outcomes and to avoid options that may lead to undesirable

outcomes, regardless of the probability of these outcomes actually occurring. This tendency often "leads to inferior outcomes," or decisions that are unnecessarily risky or not risky enough.[26] Decision-makers must consider both how much each choice is worth to them and how likely each choice is to occur; this encourages selection of the option that maximizes overall expected utility.

The expected utility calculation is a concrete way of orienting students to probabilistic considerations. When children think in terms of expected utility, they ask themselves questions like: "what outcomes do I want (or not want)?"; "how much satisfaction (or dissatisfaction) will I experience from each possible outcome?"; and "how likely are each of these outcomes?" Then, they assign numbers to their answers to such questions. To calculate expected utility, the decision-maker multiplies how much each option is worth to them by the probability it will happen.

In certain decision situations, each option has an objective, measurable value and probability. These situations call for a more straightforward, introductory calculation of expected value. For example, if a lottery ticket offers a 20 percent chance of winning $100, the expected value is 0.20 x $100, or $20. More abstract decisions may require the decision-maker to evaluate and identify the subjective desirability of each potential outcome and to use subjective probabilities derived from their estimates and personal judgment. Consider the following scenario: a child is deciding whether to audition for the school play. They rate the anticipated experience of being in the play an 80 out of 100. But many of their classmates are also planning to try out, so they estimate that there is a 65 percent chance they will get a part. The expected utility in this case is 80 x 0.65, or 52. The child would repeat this process for other extracurricular activities they are considering, pursuing the one with the largest expected utility.

More advanced calculations of this nature hone students' ability to "quantify and compare the probabilities of each possible event."[27] After making a decision, children can then reevaluate their initial probability estimates, gradually improving the accuracy of these estimates.[28] With practice, this way of thinking can become habitual: children can become more mindful of probabilities when deciding among options to maximize their expected utility.[29]

Consider, too, the following anecdote from the Alliance for Decision Education: a high school teacher in the Alliance's Decision Education Teacher Fellowship program encouraged student government representatives to use expected utility to decide which initiatives to pursue in the upcoming school year. The student representatives ranked the benefit of addressing various student concerns—from dress code to cell phone policies—on a scale of one to ten and expressed the likelihood

of receiving administrative approval for each initiative as a percentage. Then, they calculated and discussed the expected utility of each initiative, distinguishing exciting ideas that were feasible from those that were not. The teacher reported that it was "the most helpful tool" they used to support these students.

Base Rates

The tendency to neglect probability also applies to base rates—or, numbers that represent the naturally occurring frequency of something in a general population. Base rates provide decision-makers with information about the likelihood that certain events will occur and should inform judgments and decisions in uncertain situations.[30] However, people tend to overweigh the importance of characteristics specific to their situation and tend to disregard objective statistical information; this phenomenon is called base rate neglect.[31] For example: imagine a child who is deciding where to sit at tonight's baseball game in order to maximize their chances of catching a fly ball. According to base rates, fans catch fly balls most often in section 50. But a friend shares anecdotally that they caught a ball in section 10.[32] The child may feel more inclined to sit in section 10, neglecting the base rate. This tendency is "one of the most significant departures of intuition" from rational decision-making.[33] Decision-makers often dismiss base rates as irrelevant, so it is especially important to demonstrate their relevance to decision-making for students.[34]

Teachers can help students conceptualize how to incorporate base rates into their decision-making by introducing the "outside view" and "inside view."[35] Taking the outside view means considering general trends and objective evidence from similar situations, including base rates. Students might ask themselves: "How do situations like this usually go? How have they gone in the past? How likely is this in the general population?" For example, if students are using the outside view to predict the likelihood that the school debate team will beat their rivals, they might refer to how the team has performed in similarly high-stakes situations. Children can work through a variety of predictions about a range of topics, identifying which base rates they would refer to when taking the outside view and perhaps even researching them. By contrast, taking the inside view means relying on evidence from the current situation. Students might ask themselves: "What makes this situation different or unique?" To continue the example: maybe the best student on the debate team has been out sick with the flu, thus impacting the team's chance of winning.

> "…students can learn to *tolerate and navigate* a world riddled with **uncertainty**…"

Teachers can guide students as they make predictions that are relevant to course material or, for that matter, their lives beyond the classroom. To yield the most accurate predictions, students should take the outside view first, generating predictions based on relevant base rates. Then they can take the inside view, identifying details specific to the example and discussing how these details modify their initial predictions, if at all.

Why Teach Probabilistic Thinking?

The benefits of promoting probabilistic thinking skills in the classroom—as well as in students'

homes and communities—are both significant and widespread. The aforementioned practices invite students to engage actively in classroom learning. Probabilistic thinking skills empower students to be authorities on their own knowledge and agents of their own learning.

By using their probabilistic thinking skills, students can learn to tolerate and navigate a world riddled with uncertainty, forming judgments and making decisions with the best information available to them. Probabilistic thinking cultivates students who are open to changing their minds, acknowledging multiple possibilities and perspectives, pursuing an accurate worldview, and making informed and improved decisions. This leads to better outcomes not only in their own lives and in the lives of those around them, but also in society as a whole. Ed

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The Alliance for Decision Education (the Alliance) is a national nonprofit and field builder with the mission of improving lives by empowering students with essential skills and dispositions for making better decisions. The Alliance partners with teachers, academic and business leaders, families, and community members to raise awareness and lead the growing call to have Decision Education taught in schools across the country.

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TEACHING METACOGNITION THROUGH FLAG TIME

How to Empower and Equip Students for Lifelong Learning

by Anne Baldisseri, Bruna Alves, Gabriela Mayer, and Andrea Davis

Metacognition, the ability to understand and regulate one's own thinking and learning, is a key skill that plays a central role in effective learning at all ages.[1] Through development of metacognitive skills, students become aware of their strengths, weaknesses, and learning strategies. Metacognition promotes intrinsic motivation and autonomy by giving students the tools to take ownership of their learning. By setting goals, monitoring progress, and reflecting on their learning processes, students cultivate a sense of empowerment and become active participants in their educational journeys.[2]

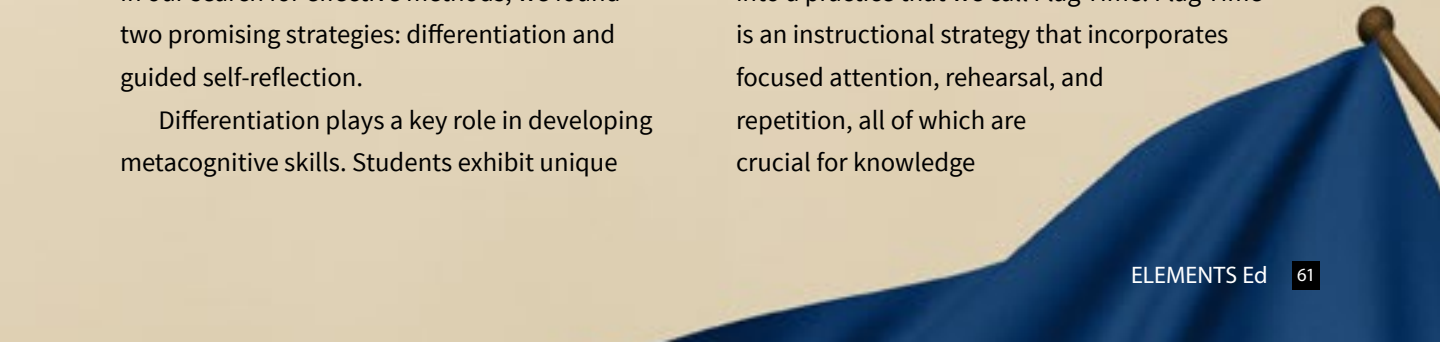
Well-designed instructional strategies promote curiosity, intrinsic motivation, engagement, and critical thinking. They also encourage self-reflection and metacognition, enabling students to assess their progress and set goals for continuous improvement. As a result, students become more adept at managing their learning, develop a deeper understanding of different disciplines, and ultimately become smarter learners.

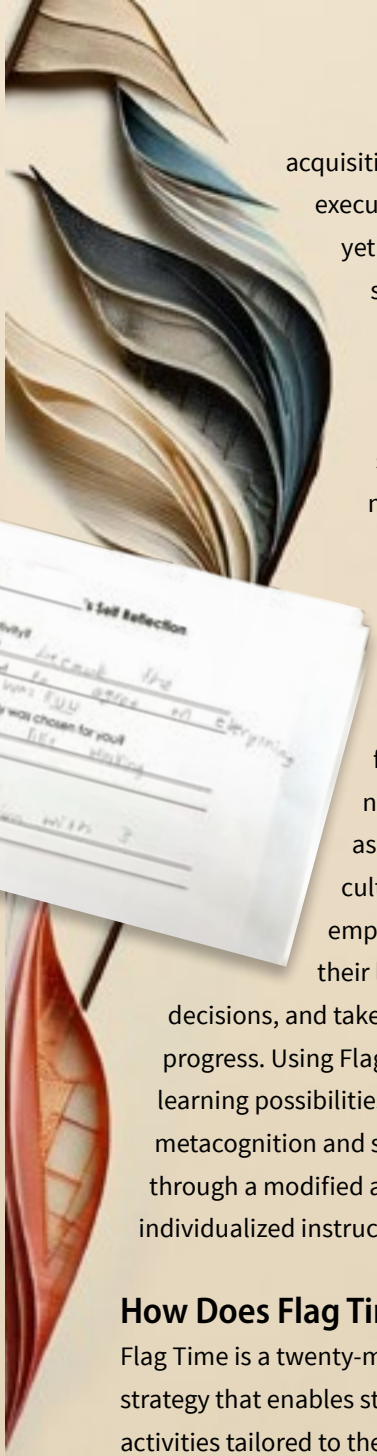
However, it is challenging to develop metacognitive skills in children at school and at home because children have varying degrees of cognitive development, life experiences, abstract thinking, and executive functioning skills. Guidance and modeling may not always be available to walk children through the practice of metacognition, which requires patience and self-awareness.[3] In our search for effective methods, we found two promising strategies: differentiation and guided self-reflection.

Differentiation plays a key role in developing metacognitive skills. Students exhibit unique knowledge, interests, and skills during early childhood and elementary school. Metacognitive skills include being able to discern our own areas of strength and challenges. Differentiation helps support metacognition because it prompts children to link a learning activity to their specific learning needs.[4] Differentiated instruction further enhances motivation and engagement by offering choices and autonomy tailored to individual student's interests and abilities.[5] When teachers provide students with choices and create activities that are aligned with students' interests, goals, abilities, and cultural values in an intentional and purposeful way, differentiated instruction recognizes the pace, interests, and abilities of students.[6]

The second key ingredient in developing metacognitive skills is self-reflection, through which teachers help students describe and evaluate their own learning and challenges and set goals for themselves. Reflection allows students to take ownership of their learning progress, monitor their understanding, identify areas of confusion or misunderstanding, and take proactive steps to address them. Teachers guide this reflection process by providing specific questions and prompts that allow students to think about their own learning. In the process, setting clear goals helps students monitor their own progress. Providing opportunities for self-reflection also encourages students to develop strategies to overcome challenges and adjust their learning approach to better meet their goals.

We combined these metacognitive strategies into a practice that we call Flag Time. Flag Time is an instructional strategy that incorporates focused attention, rehearsal, and repetition, all of which are crucial for knowledge





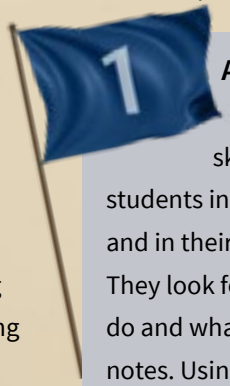
acquisition and the development of executive functions.[7] Challenging yet attainable tasks within students' zone of proximal development, coupled with the opportunity to engage in deliberate practice, allow students to develop a growth mindset and perseverance.[8] Reflection on their learning experiences and strategies enables students to assess their progress, identify areas for improvement, and set new goals. The reflective aspect of Flag Time aims to cultivate metacognitive skills by empowering students to monitor their learning, make informed decisions, and take responsibility for their progress. Using Flag Time, we aim to expand learning possibilities for children by promoting metacognition and self-regulated learning through a modified approach to differentiated, individualized instruction.

How Does Flag Time Work?

Flag Time is a twenty-minute daily instructional strategy that enables students to engage in activities tailored to their interests and unique needs. We call the activity Flag Time because children find a flag that bears their name and a designated activity based on their interests. Flag Time activities can take a variety of forms, ranging from word games to multistep math problems, from writing prompts to book club discussions. During Flag Time, teachers foster metacognitive thinking by providing direct feedback and creating opportunities for students to describe their own learning.[9]

At first, Flag Time in the classroom looks like the more familiar activity "Center Time." Students work in groups at different tables; some play math games while others work together on spelling or word recognition. Looking more closely, an observer can see the activities are differentiated; each group (and sometimes each student within each group) has a task specifically chosen to fit their learning needs and goals. Teachers float around to each group supporting, encouraging, and stretching students where needed. It isn't until Flag Time ends that the metacognitive work begins. Each student walks to their cubby and gets a laminated reflection sheet. With a dry-erase marker, students indicate—by circling a sad face, a smiling face, or a neutral face—whether they have enjoyed the task that day, whether it was difficult or easy, and what their favorite part of the session was. At the end of each week, students fill out a similar but more extensive reflection about their learning throughout the week, their preferences, strengths, and weaknesses across math and reading.

The organization and implementation of Flag Time take place in the following steps:



Assessment of Skills and Interests

In order to determine students' skills and interests, teachers observe students in everyday activities and games and in their interactions with each other. They look for evidence of what students can do and what they are interested in and take notes. Using the notes, teachers identify skills to be practiced as well as students' varying interests and strengths.

2 Grouping and Activity Design

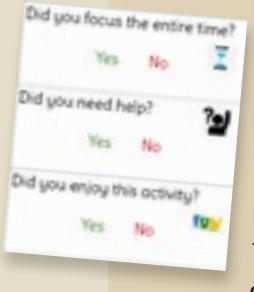
Teachers group students with similar skills and interests and create specific activities for each group. Teachers design groups strategically so that each student is appropriately challenged while successfully completing the activity within 20 minutes. Teachers use a small flag with the student's name or photo to help students identify their assigned activity.

3 Implementation

Teachers invite students to look for their respective flags to begin their activities, explain the learning objectives for each group, and provide support, feedback, and guidance to students where necessary. A stopwatch (maximum 20 minutes) tracks each group's time on task.

4 Monitoring and Reflection

Students use checklists (right) to monitor their own learning and progress during Flag Time. These checklists also allow students to reflect on important aspects of the activity they participated in, such as motivation to learn, types of learning skills used, or learning objectives. Once the activity is over, teachers encourage students to explain their reflections to the teacher or to a classmate.



5 Weekly Reflection

On a weekly basis, teachers invite students to describe and evaluate their own learning through self-reflection and to record the activities they enjoyed and found interesting or challenging. At week's end, students include a record of one activity in a Flag Time portfolio by creating an audio recording about the activity or posting a photo referring to the activity, along with a comment in an electronic learning journal. Teachers also inquire about the learning process and help students identify strategies[10] for the next Flag Time activity using questions such as, "What did you learn?", "What was difficult?", and "What strategies did you use to try to overcome the challenge encountered?" Teachers can use these student self-reflections for future planning and in their communication with parents.

Conclusion

Flag Time promotes self-regulation by enabling students to create their own toolkit of strategies to use when encountering a difficulty. Critical thinking is naturally developed as students reflect on their own work by questioning and criticizing their methods of thinking.[11] Finally, students start transferring their learning across different areas as they recognize connections among different learning contexts and apply their knowledge, skills, and understanding to new situations. By reflecting on their own learning processes, students can better understand how to transfer their learning to real-world scenarios.

Flag Time as a daily instructional strategy enhances motivation and engagement by giving students the opportunity to work on tasks aligned with their interests and skill development. By incorporating reflection into each activity, Flag Time also enables metacognitive growth.

Well-designed instructional strategies like Flag Time promote curiosity, intrinsic motivation, engagement, and critical thinking. They also encourage self-reflection and metacognition, enabling students to assess their progress and set goals for continuous improvement. As a result, students become more adept at managing their learning, develop a deeper understanding of different disciplines, and ultimately become smarter learners. Ed

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Andrea Davis brings more than a decade of experience in primary education in international schools. Andrea has led professional development in areas ranging from phonics training to classroom culture to differentiation. She is the founder of the project Teach to Grow, Grow to teach, a teacher coaching business.

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Increasing METACOGNITION

Practical Strategies to Cultivate an Essential Thinking Skill

Metacognition is thinking about one's own thinking. This skill involves awareness and control of one's mental processes, including the planning, monitoring, and evaluation of learning as well as adaptive strategies and reflection on outcomes.

Metacognition makes kids smarter by helping them to become more effective thinkers and learners. Here are a few ways to increase kids' metacognition:

Align teaching of metacognitive skills with students' mental development. Metacognitive abilities develop gradually over time. Young children often have limited metacognitive skills, which results in an overestimation of their own abilities. While metacognition's natural development continues beyond school age, it can be taught, learned, or practiced earlier. A deliberate focus on developing awareness of thinking processes in the early years (during elementary and primary schooling) will be most effective, while teaching and encouraging control strategies is most effective when the brain is more fully developed.

Introduce specific metacognitive strategies like goal-setting, visualization, self-monitoring, reflection, and self-assessment.
Explicitly teaching students when and how to use these strategies can boost their awareness and control of their own cognitive processes. Modeling and "thinking aloud" can help students understand how to apply these strategies for themselves.

Encourage regular reflection on learning experiences.
Reflective journaling and discussions facilitate metacognitive awareness. Constructive feedback that focuses on the process of learning is necessary to guide students in improving their use of these strategies and more accurately self-assessing in the future.

Scaffold the use of metacognitive strategies.
Offering students assistance when it is needed and then gradually withdrawing it as they become more proficient in applying metacognitive strategies independently will help students to incorporate metacognitive skills in their learning organically.

Use tools and techniques like concept mapping, self-questioning guides, and metacognitive journals.
These tools aid students in organizing their thoughts and developing a deeper understanding of which thinking strategies work best for them. They also help students see the areas in which they might need support.

Practice metacognitive skills not just at school but also at home.
Parents can reinforce metacognitive skills at home by discussing learning experiences, encouraging goal-setting, and asking open-ended questions that promote reflection and critical thinking. Ed

MISTAKEN BELIEF

We learn more *when taught in our* preferred learning style.

THE FACTS

The lack of evidence suggests otherwise.

That learners can be categorized by styles and taught accordingly, resulting in improved learning—it's an enduring educational myth, despite an absence of evidence.[1] Empirical studies that investigated aligning instruction to learning style found no support for improved learning outcomes.[2]

Two commonly invoked theories about learning styles categorize learners as visual, auditory, or kinesthetic (VAK); or as accommodating, converging, diverging, or assimilating. While many students do have preferences, those exist on a continuum: they are not fixed, and they often change depending on circumstances. This makes the way in which someone describes their own preferences inconsistent and unreliable, which leads to constraints being placed on students when those preferred approaches are overemphasized.

Learning style theories also distract us from an essential evidence-based finding: a multisensory presentation of information enhances learning.[3] This means students more easily encode new information when it is presented via multiple formats (that is, visually, auditorily, and kinesthetically) rather than only one (e.g., just auditorily)—even if that format was stated as a preference.

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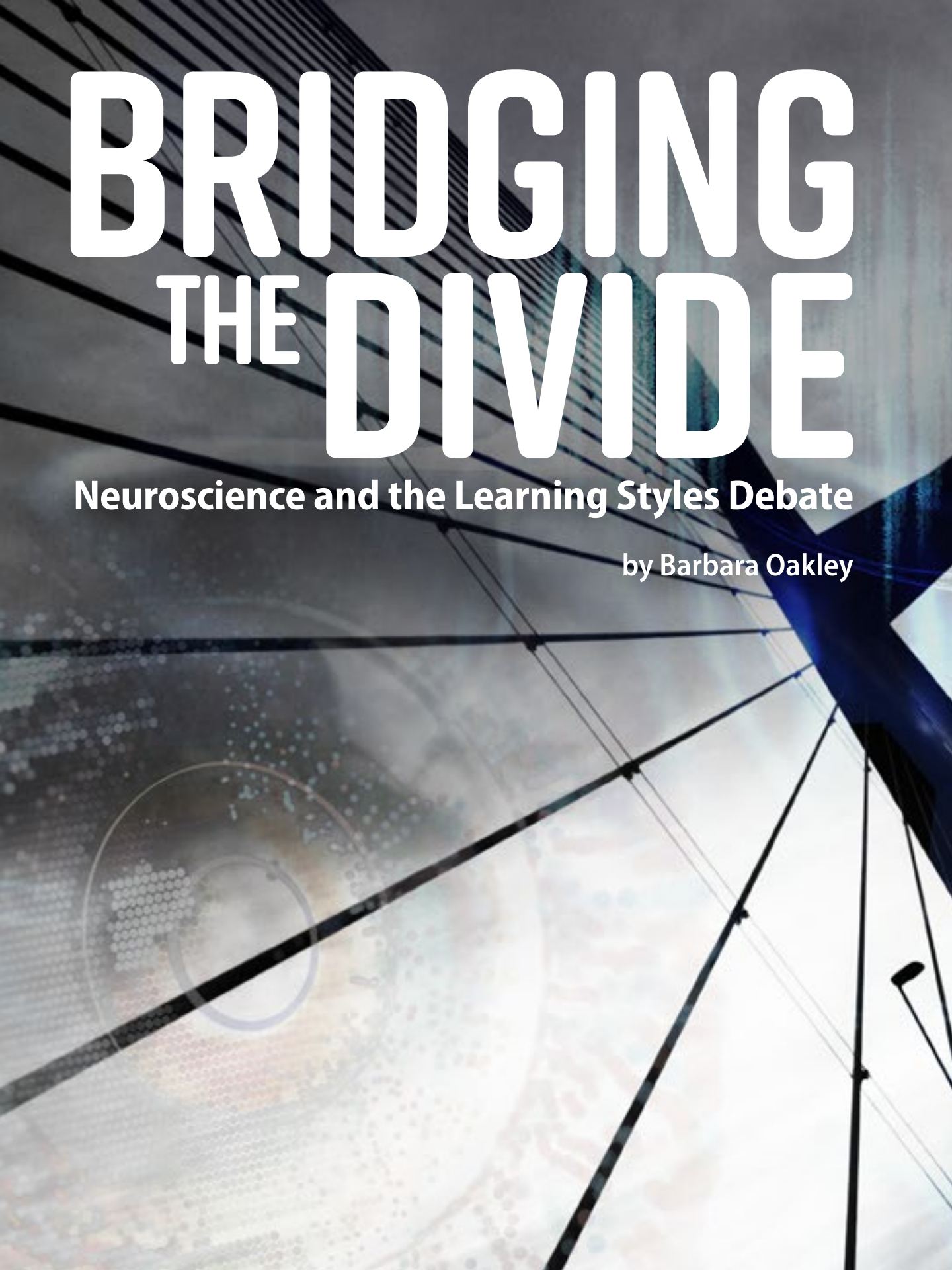


BRIDGING THE DIVIDE

Neuroscience and the Learning Styles Debate

by Barbara Oakley

One of the biggest controversies in education centers on learning styles. Those who say that learning style differences exist believe, for example, that some people learn better by hearing while others learn better by seeing. But most prominent psychologists cite research revealing that "auditory" and "visual" learners learn similarly and conclude that learning styles don't actually exist. This debate matters because how we understand learning has concrete implications for educational policy and teaching practices. All this means that it's worthwhile to bring fresh perspectives from neuroscience to this long-simmering and contentious issue.

When Definitions Collide: Style Versus Ability

One keen opponent of the idea of learning styles is Daniel Willingham—a psychologist who has done admirable work in education. Willingham observes:

> Ability is that you can do something. Style is how you do it. Thus, one would always be happy to have more ability, but different styles should be equally desirable. I find a sports analogy useful here. Two basketball players may be of equal ability, but have different styles on the court, one being a risk-taker, and the other quite conservative in his play. (Sometimes people say it's obvious that there are learning styles because blind and deaf people learn differently. This is a difference in ability, not style.)[1]

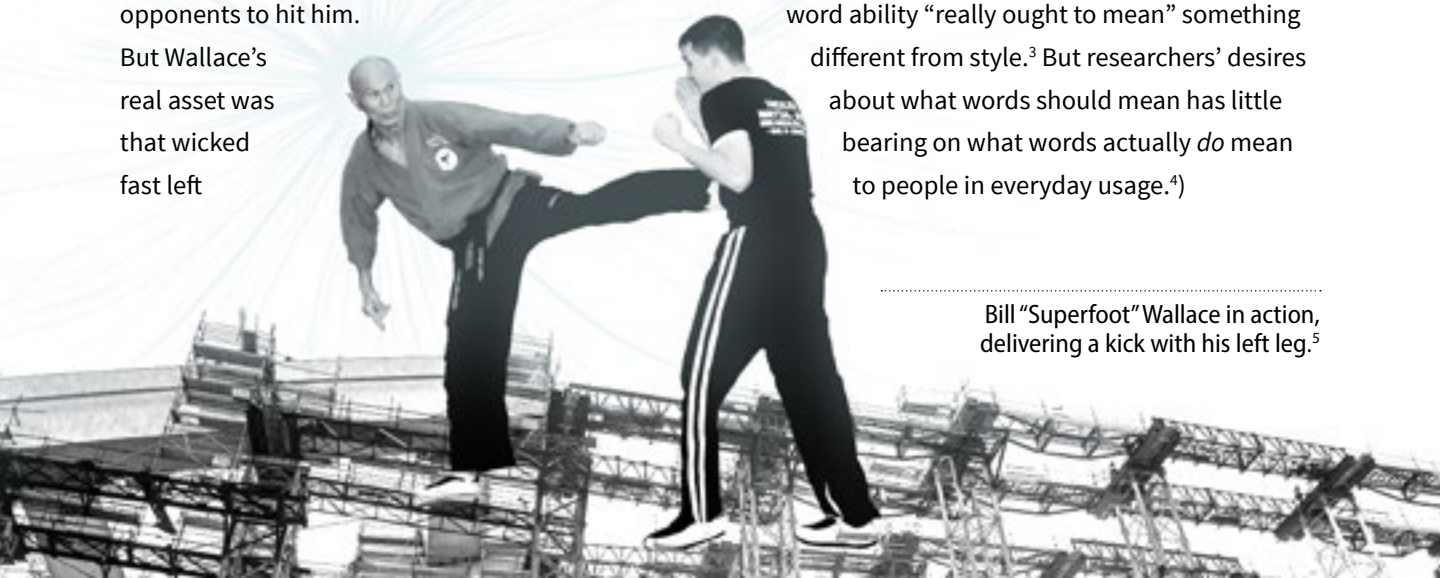
It seems like a clear difference. But what if ability *affects* style?[2] Let's draw again on sports, as Willingham did, to show you what I mean.

Bill Wallace was a prominent American martial artist famous for his left leg kicks, delivered with such extraordinary speed that they earned him the moniker "Superfoot." Wallace fought using a distinctive style—he often stood sideways, left leg toward his opponent. The sideways stance reduced his target size, making it more difficult for opponents to hit him. But Wallace's real asset was that wicked fast left foot—his roundhouse and hook kicks were clocked at 60 miles per hour.

The ultimate question, however, is this: Was Wallace's left-footed approach his style? Or his ability? Or let's throw our own hook in here: Was Wallace's distinctive style perhaps related to the flip side of ability—that is, to his *disability?*

Behind Wallace's characteristic style, as it turns out, lay an injury. Wallace damaged his right knee during a practice session in his early years. The injury meant that his practice centered on developing his left leg while holding his right leg as his point of stability. This lopsided practice gave Wallace an extraordinary ability with his left leg, which allowed him to outclass his opponents. He would ultimately become the Professional Karate Association World Full-Contact Champion, ending his career with a 23-0-0 record. In other words, Wallace's style grew from his *ability* with his left leg. This ability grew from the *disability* in his right leg, pushing him to practice excessively with the left.

As Wallace's example shows, the terms *ability, disability,* and *style* shade into one another in a sort of "stylability" mashup. If style might be caused by ability, there would often be a strong correlation between the terms. Placing a neat divide between these concepts that works for every context would be impossible. (Willingham himself notes that the word ability "really ought to mean" something different from style.[3] But researchers' desires about what words should mean has little bearing on what words actually *do* mean to people in everyday usage.[4])



Bill "Superfoot" Wallace in action, delivering a kick with his left leg.[5]

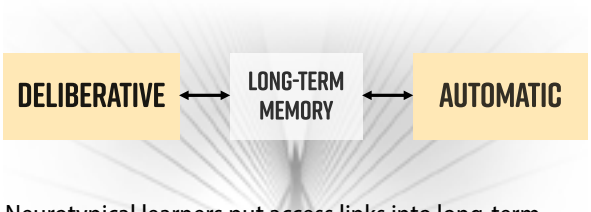
Ambiguities in words abound. One recent study found that "at least ten to thirty quantifiably different variants of word meanings exist for even common nouns."[6] Further, people are unaware of this variation and exhibit a strong bias to erroneously believe that others share their semantics. Ultimately, there will always be points where ability and style share so much context that it will be tough to tell whether you are talking about ability versus where you're talking about style. Just like with Bill Wallace.

Let's back up a moment and think about the term *ability* in contrast with *disability*. Modern ways of thinking often devolve to the idea that there's no such thing as a disability—there are just differing abilities. But Jill Escher, the mother of two profoundly disabled autistic children and president of the National Council on Severe Autism, poignantly reminds us: "While revisionist histories have preached that autism is natural neurodiversity that has always been here but we somehow never noticed it, in the real world the numbers of disabled autistic adults in need of lifespan care are swelling, and fast."[7] When neural diversity might go to an extreme, the result can be profoundly disabling.

There can be a sweet spot, however. Cognitive disability in certain areas can, it seems, sometimes lead to enhanced cognitive ability in other areas. Many would call the result a difference in a learner's style. Whatever terms you use, thinking about trade-offs is vital, as neuroscientist Michael Ullman's pioneering theories have shown.[8] Ullman's exploratory research has helped us better understand the interplay between two major learning systems in the brain: deliberative and automatic. Differences in how these systems function can mean profound differences in how a student prefers to learn.

Deliberative Versus Automatic Learning

Evidence is clear that learning involves creating links between neurons in long-term memory. Those links are generally stored in and retrieved from long-term memory in the brain through two different pathways. We'll call them the deliberative and automatic pathways.[9] The two different pathways produce links with different characteristics. Most people use the links created by both pathways to do their learning and thinking.



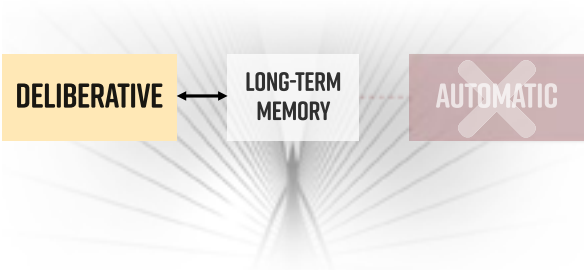
Neurotypical learners put access links into long-term memory in a balanced way using either their deliberative or automatic systems, depending on the task.

For example, you are reading this page because you can do quick, unthinking parsing of the squiggles of letters into words because of years of practice that have helped you build powerful automatic links. But your understanding of the meaning of the sentences and paragraphs is largely due to the processes of your deliberative system. (If you're aware of Nobel Prize-winning psychologist Daniel Kahneman's work *Thinking, Fast and Slow*, the deliberative pathway involves "slow" thinking, while the automatic pathway involves "fast" thinking.)

Interestingly, it's often possible to learn the same thing with either system—it's just that specific systems are better for certain types of activities, so there can be awkwardness if the other system is used. We can begin understanding students' differences in "stylabilities" by understanding differences in deliberative and automatic learning systems.

The Dyslexia Spectrum

Sometimes, either the deliberative or the automatic learning system is disrupted. We see this, for example, in children with dyslexia—a syndrome frequently affiliated with dysfunction in the automatic system.[10] Remember what I mentioned earlier, that "quick, unthinking parsing of the squiggles of letters into words"? In dyslexia, that effortless, natural, automatic ease with reading isn't possible.



Dyslexia often seems to be associated with challenges in the automatic learning system.

This means that, for children with dyslexia, listening to someone speak is often a lot easier than reading those same words. And so those with dyslexia often listen to spoken words to allow them to absorb materials that others might typically read silently.[11] Such students might easily begin thinking of themselves as auditory learners. In important ways, they are—even though, as we shall see, these students can also sometimes have unique abilities with visualization.

Depending on the country doing the diagnosing, between 3 percent and 15 percent of students have dyslexia, which is often affiliated with other syndromes that create challenges in learning.[12] All this can mean diagnosing dyslexia can be like chasing the edges of wispy clouds.[13] But the fact that only 32 percent of fourth-grade public school students in the U.S. are at or above the standard reading proficiency level hints that dyslexia, sub-clinical dyslexia (that is, a person who has some, but not all, of the symptoms of dyslexia), and related syndromes may be more widespread than commonly thought.[14] Or perhaps it is simply that many teachers use whole language approaches to reading that deemphasize automaticity, which is enhanced by phonics instruction. Oddly enough, this might result in difficulty with reading similar to that of dyslexia.

Some tests reveal that a particular group of students learn better by hearing than by reading.[15] "Ah," cries the teacher, "this provides strong evidence for learning styles!" Then you might reveal these are students with dyslexia, and suddenly researchers pull a terminological switcheroo: "No, no," they cry, "that relates to ability, not a learning style!" *Even if it has precisely the same result: a student who learns better by hearing.* It's no wonder that teachers are left confused. They see profound evidence in their classrooms that some students learn better by listening, but they are somehow expected to understand that what they see can't possibly be an auditory learning style.

There are substantial clues that those with dyslexia compensate for their automatic system challenges by leaning in on—and enhancing—their ability to learn deliberatively.[16] One effect may relate, oddly enough, to enhanced visualization abilities, which can involve the deliberative hippocampal system.[17] These differences can go hand-in-hand with an ability (or is it a style?) to see matters from a bigger-picture perspective and make perceptive connections that others miss. Research is revealing that dyslexia may grow from very specific auditory challenges, perhaps related to the neural circuits the brain pours energy into during times of

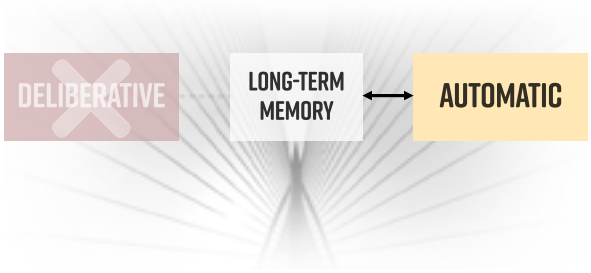
stress in infancy and toddlerhood.[18] Much research lies ahead.

An associated effect might involve enhanced abilities to memorize and remember. As Nobel Prize-winning microbiologist Carol Greider notes: "As a kid I had dyslexia. I had a lot of trouble in school and was put into remedial classes. I thought that I was stupid…. I kept thinking of ways to compensate. I learned to memorize things very well because I just couldn't spell words. So later when I got to take classes like chemistry and anatomy where I had to memorize things, it turned out I was very good at that."[19]

As one mathematician with dyslexia observed: "The dyslexia… I explain to people, it's sort of like you're strong in one thing, but it makes you weak in others."[20] Of course, causality may work the other way—weakness in some areas may lie behind the strengths in others.[21]

The Autistic Spectrum

There's evidence of a different group of learners who sometimes share challenges with their automatic learning systems, as with those with dyslexia. But these learners can sometimes be quite different, instead having *enhancements* of their automatic system.



Autism can be associated with enhancements in automatic system learning, sometimes coupled with challenges in deliberative learning.

By way of background, the automatic system underlies our ability to use motor and cognitive skills that we don't have to think about. It also involves our ability to perform habitual actions. Sadly, the automatic system is often characterized as merely the simple seat of rote learning. But automatic learning, which is exceptionally strong in children, also allows us to assimilate complex patterns, such as the grammatical structures of our native language.[22] Using the links laid by the automatic system, we can speak in our native language about complex ideas without thinking about the words we're using. By contrast, adults acquire new languages primarily through their deliberative systems. With much practice, these adult learners may be able to speak an additional language fluently. However, the heavy reliance on the deliberative system can still make expressing themselves slower and more tiresome than speaking their native language.[23]

Michael Ullman provides evidence that those on the autistic spectrum may have challenges with either their automatic or deliberative learning system, which can result in enhanced functioning of the other system as the learner compensates.[24] This explains why those on the autistic spectrum can sometimes quickly grasp holistic patterns in a way that neurotypical students find difficult—whether those patterns involve math, computer algorithms, language learning, art, or any other pattern-related activity. This pattern of learning, incidentally, has been dubbed "global" versus "sequential" in learning styles approaches.[25]

Enhanced automatic learning skills can also explain another significant challenge experienced by those on the autistic spectrum in today's classrooms—they can struggle to explain what they know. Automatic knowledge is complex and not

linear by its very nature—it doesn't lend itself to sequential explanations. We do these potentially deeply talented children with autism a disservice when we insist they must be able to explain (which uses the deliberative system) what they understand at a deep conceptual level through their automatic system. The odd result can be that parroted explanations with little proper conceptual understanding can earn top grades, while those who find it difficult to verbalize their knowledge can fail despite their evident expertise with the material. It is no wonder that gifted, neurodiverse students can become disenchanted with school.

Conflicting Perspectives on Learning Styles

It is no surprise that learning styles debunkers have often pooh-poohed the idea of learning styles.[26] In the wild west of the learning styles heyday, anybody could develop a learning styles inventory, and as a result, it seemed almost everybody did. Debunkers have used some of these old learning style tests to show they don't work, leading them to conclude that there is no such thing as learning styles.[27] Debunkers also fear that teaching to a student's supposed style—for example, always reading aloud to an auditory learner—will blinker that student's ability to learn by reading silently. (This matching of teaching approach with learner style is known as "the meshing hypothesis.")

But many learning style proponents, including Richard Felder—the Princeton-trained Hoechst Celanese Professor Emeritus of Chemical Engineering and inaugural winner of the lifetime achievement award from the American Society of Engineering Education—insist that the meshing hypothesis is an inaccurate characterization of how most teachers use knowledge of learning styles. They suggest that teachers commonly teach toward a balance of learning styles to ensure all the students in a typical class experience what is perhaps their "best" way of learning, even as they

are exposed to other ways of learning. In other words, a key idea from learning styles approaches is to ensure that the various modalities aren't missed. Felder makes the case that learning style debunkers use demeaning, straw-man arguments and refuse to engage with those they are maligning.[28]

The reality is that Finland's vaunted educational system focuses on learning styles as a key pedagogical approach.[29] This certainly hasn't hurt Finland in its climb to the top of the international educational rankings.[30] Even if teaching using learning styles is wrong and bad, it doesn't seem to hurt Finnish students. In business, Ray Dalio has relied on debunked style theory as an important part of his business practice.[31] This clearly hasn't hurt his company, Bridgewater Associates, which is the world's largest, most successful hedge fund.

> "There was an **UNWILLINGNESS** to look at the issue with **FRESH EYES** and an **OPEN MIND**…"

Debunkers imply, for example, that teachers all huddle in a corner reading aloud to "auditory" learners, harming their reading ability. But it seems the vast majority of teachers are prompted by learning styles theory to use visuals to read aloud sometimes to their classes and to encourage students to get their hands on things. Despite vocal claims to the contrary, whether teachers use these varied approaches because of a problematic learning style theory or because it's good general teaching practice may not make much difference. The sky is not falling. Exaggerating the horrors of learning styles may have had the unintended consequence of reaffirming learning styles for many teachers, even as these teachers lose further respect for academic research findings. Unfortunately, it's not like entire fields and even great theoreticians with tens of thousands of citations haven't wandered astray in the past.[32]

As a researcher, writer, and public speaker, I have long supported the debunking of learning styles. The debunking literature is in some sense solid—visual and auditory learners perform equivalently in tests involving visual and auditory materials. And there are clearly profound problems in many learning styles inventories. Yet having friends on both sides of the debate has caused me to become curious about this area. As I dug into the literature, I tried to emulate my most admired scientific heroes. That is, I tried to keep my mind open to fresh perspectives. The more deeply I dug over the years, the more I realized that both the learning styles literature and the debunking literature often hinge on superficialities that avoid the in-depth insights that neuroscience is beginning to provide.

As I began to work on this article and sent drafts to researcher friends, I was surprised to see how often they responded that there are no learning styles, case closed. There was an unwillingness to look at the issue with fresh eyes and an open mind—perhaps understandable when researchers must contend with the flood of confusing new data on their everyday studies. But then I was shocked to see how often feedback from debunker friends swirled around elusive definitional quibbles. Some debunkers took issue even with how their fellow debunkers, such as Dan Willingham, defined learning styles. Common feedback centered on using arcane definitions dug from the crevices of decades-old literature or devising their own closeted definition of learning styles that clearly veered far from the vernacular. Sadly, this is a game anyone

could play to disenfranchise another's ideas. I could say, "math only applies to counting livestock." Then, by my definition, most math wouldn't be "real" math. But that's not the vernacular definition of math.

Rightly or wrongly, some learning style proponents have gotten the sense that psychologists are subconsciously biased to use their own definitions of terms as a form of microaggression that demonstrates their superior knowledge, protects their disciplinary turf, and puts teachers in their place. Well-meaning teachers sometimes join psychologists to signal their awareness of latest research findings. The resulting divisiveness makes it doubly challenging to suggest insights from neuroscience, an unfamiliar subject for many psychologists and teachers. In the final analysis, many debunkers have decades on record denying the faintest hint of learning styles. The career stakes for these long-time debunkers of learning styles are high, which can make them hesitant to look at or acknowledge results from fields like neuroscience. No matter how convincing neuroscientific findings might be, underlying bias can incline debunkers, if they can even be brought to look at potentially contrary findings, to nitpick definitions or details of the results without acknowledging the big picture.

Some would say that providing information supporting learning styles gives aid and comfort to potential fraudsters. But dismissing differences in learning patterns out of hand has its own share of problematic outcomes. For example, some anti-learning style teachers insist that those on the autistic spectrum cannot think or learn differently because there's no such thing as learning styles. (The nuance of the style versus ability argument is lost on them.) Debunkers also raise the concern of wasted money on poorly vetted materials. This is a valid point—yet one can't help but wonder why some are given a pass in the target-rich environment of misspent educational dollars.[33] It seems that opposition to recognizing patterns of differences in learning, whatever the cause, has taken on a life of its own that's sometimes gone well beyond the original intentions of learning styles debunkers.

At the same time, debunkers are right when they point toward oversimplified learning styles theories that place students into rigid categories like "auditory learner" or "visual learner." Saying that someone learns better via auditory than visual modalities in certain circumstances is not the same as saying that someone learns better via auditory means in all circumstances and with all kinds of material, which is what traditional learning styles theory often points toward. That is easy to debunk and it has been debunked. But while debunking simplistic learning style theories, we can't overlook the real individual differences and nuanced patterns found among groups of students. We should remain open to the possibility of subtle patterns of differences in how people learn.

> "... DISMISSING DIFFERENCES in LEARNING PATTERNS out of hand has its own share of PROBLEMATIC OUTCOMES."

Bridging the Divide: Finding Common Ground

Neuroscience is revealing many exciting insights regarding learning and thinking styles. Michael Ullman's deliberative-automatic theories unlock new grounds for exploration, but there's more. For example, recent research published in *Nature*

Human Behaviour suggests that some people are averse to uncertainty, while others tolerate ambiguity with no problem.[34] This seems akin to the old learning style conceptions of "judgers (...seek closure even with incomplete data)" and "perceivers (...resist closure to obtain more data)."[35] Findings like these in *Nature* drive home an important point: we can now quantify categories of thinking and learning styles by directly observing differences and commonalities in how concepts are stored, accessed, and analyzed by the brain.

A debunker might observe that these ideas are sneaking close to conceptions of cognitive styles, a term which doesn't have the bad rap of learning styles. Again, we're back to overlapping conceptions. When is cognitive style different than learning style? The answer: when a learning styles debunker is involved. The reality is that, in everyday use of the terms, cognitive styles such as holistic versus analytic go hand in hand with learning styles.[36] No matter how specialists might say that these two concepts are entirely distinct, they are not. They overlap in how we think about them in the brain (the semantic locations of the concepts), in word vector analysis, and in vernacular use. If cognitive styles are valid, and learning styles are intimately tied in with cognitive style, then there would be something to learning styles.

Not only learning style researchers, but many prominent scientists, writers, and thinkers over the centuries have observed patterns of differences in how people think and learn. These patterns seem very real but may not necessarily be the kind of thing, at least initially, that you can quantify with a zippy 30-minute pen-and-paper test. There are lumpers contrasted with splitters; foxes versus hedgehogs; adroit, superficial learners as opposed to clumsier yet somehow deeper learners. (Unlike their lesser peers, Nobel Prize winners Santiago Ramón y Cajal and Friedrich Hayek attributed their success to their slow and blundering way of learning.)[37] What will neuroscience unveil that might

This image conveys a sense of how the uncertainty tolerant ("lumpers") tend to store related concepts closer together in the brain. The uncertainty averse ("splitters"), on the other hand, store related concepts further apart in the brain. This is seen specifically in the left inferior frontal gyrus ("LIFG").

support or deflate these and many other ways of parsing patterns in how people learn and think?[38]

When one looks at how pedagogy treats neuroscience, a disturbing proportion of what's currently taught seems to involve neuromyths. Isn't it odd that a subject could be primarily taught by describing what it is not? Imagine the fields of geology or chemistry, for example, being taught by describing geological or chemical myths. I can't help but think that much educational neuroscience is being conveyed by psychologists and educators who are skittish about their lack of solid grounding in neuroscience. Hence the tendency to present neuroscientific findings in a reductive, negative way.

Science sometimes moves backward to move forward. A nuanced view that incorporates subtle insights from neuroscience and avoids binary thinking ("believing in learning styles is like believing in leprechauns!"; "neuroscience is always right!") will ultimately lead to more inclusive and integrative instruction.[39] Research on learning styles cries out for adversarial cooperation. This is a new approach where, instead of festering for decades with conflicts that can be tough for outsiders to adjudicate, researchers with differing views converge upon the truth by working together. Nobel Prize winner Daniel Kahneman spurred this approach with his "Adversarial Collaboration Project."[40]

> "... RESEARCH on LEARNING STYLES CRIES OUT for ADVERSARIAL COOPERATION."

The debate over learning styles has real pedagogical implications for today's highly neurodiverse classroom. Teachers need guidance grounded in evidence, not dogma, to teach responsively to students' varied aptitudes, abilities, and disabilities. There is a broad spectrum involved in syndromes like dyslexia and autism—students can manifest some symptoms, and benefit from some teaching approaches, even if they are not formally diagnosed. Telling a teacher that her undiagnosed student with subclinical dyslexia can't be counted as an auditory learner because her student is experiencing a (dis)ability, not a style, creates no end of problems. How can

teachers know? School districts certainly can't bear the burden of testing all their students for various syndromes. And even if they could, many students can fall into that shadowy spectrum between the full-blown, diagnosable syndrome and more typical behavior.

It's time to acknowledge the nuanced interplay between ability and style suggested by neuroscience and causality studies. Many teachers observe actual patterns of differences between learners that require inclusive, multifaceted instruction. Collaborative work between neuroscientists, psychologists, and educators can shape teaching practices and policies that neither ignore nor oversimplify patterns of differences in approaches to learning. This has the potential to improve outcomes for all students. Using insights from neuroscience, psychology, and education to move past the learning styles controversy will ultimately provide the best education possible to today's broad range of neurodiverse students. Ed

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Endnotes

1. Daniel Willingham, "Learning Styles FAQ," *Daniel Willingham: Science & Education* (blog), accessed August 13, 2023.

2. Some learning style debunkers, unlike Willingham, feel that the word "style" when used regarding dancing, fighting, basketball, and the like, isn't at all the same as "style" with respect to learning, although they may be hard-pressed to state why they feel this way. And they might refer to the definition of "ability" in various textbooks, as for example Bloom, Hastings, and Maddaus' 1971 *Handbook on Formative and Summative Evaluation of Student Learning*. But it's probably a good bet to say that 99 percent of instructors, even if they have read the 900-page Bloom, Hastings, and Maddaus volume or related works, don't remember to apply that specific narrow definition of the word "ability." They can't help but use the terms "style" and "ability" in the vernacular sense.

3. Willingham, "Learning Styles FAQ."

4. Qunlin Chen et al., "Common Brain Activation and Connectivity Patterns Supporting the Generation of Creative Uses and Creative Metaphors," *Neuropsychologia* 181 (2023): 108487, https://doi.org/10.1016/j.neuropsychologia.2023.108487; Timothy E.J. Behrens et al., "What is a Cognitive Map? Organizing Knowledge for Flexible Behavior," *Neuron* 100, no. 2 (2018): 490–509, https://doi.org/10.1016/j.neuron.2018.10.002; Dušan Stamenkovića, Nicholas Ichienb, and Keith J. Holyoak, "Metaphor Comprehension: An Individual-Differences Approach," *Journal of Memory and Language* 105 (2019): 108–18, https://doi.org/10.1016/j.jml.2018.12.003; Keith J. Holyoak and Dušan Stamenković, "Metaphor Comprehension: A Critical Review of Theories and Evidence," *Psychological Bulletin* 144, no. 6 (2018): 641–71, https://doi.org/10.1037/bul0000145; Emanuel Derman, *Models. Behaving. Badly.: Why Confusing Illusion with Reality Can Lead to Disaster, on Wall Street and in Life* (New York: Free Press, 2011); Mathias Benedek and Andreas Fink, "Toward a Neurocognitive Framework of Creative Cognition: The Role of Memory, Attention, and Cognitive Control," *Current Opinion in Behavioral Sciences* 27 (2019): 116–22, https://doi.org/10.1016/j.cobeha.2018.11.002.

. You can have fun comparing the semantic contexts of ability and style in ChatGPT by using a prompt like "Calculate the semantic similarity between 'ability' and 'style' using Word2Vec." The similarity is 0.63. Not identical, (which would be 1.0) but pretty high.

   Some debunkers take issue with the analogies we're using in these contexts, stating that all analogies break down at some point. This is true, but analogies and metaphors are also invaluable in the learning and transfer process and are an integral part of the creative thinking process. As the great quant Emanuel Derman has pointed out, even mathematical equations are metaphors.

5. Claus Michelfelder, *Bill Superfoot Wallace in Action*, photograph, Wikimedia Commons, September 19, 2011, https://commons.wikimedia.org/wiki/File:Kampfkunst_2011_067.JPG.

6. Louis Marti et al., "Latent Diversity in Human Concepts," *Open Mind* 7 (2023): 79, https://doi.org/10.1162/opmi_a_00072.

7. Jill Escher, "The Autism Surge: Lies, Conspiracies, and My Own Kids," *The Free Press*, July 20, 2023, https://www.thefp.com/p/the-autism-surge-lies-conspiracies.

8. Michael T. Ullman, "The Declarative/Procedural Model: A Neurobiologically Motivated Theory of First and Second Language," in *Theories in Second Language Acquisition: An Introduction*, 3rd ed., eds. Bill VanPatten, Gregory D. Keating, and Stefanie Wuff (New York: Routledge, 2020), 128–161; Michael T. Ullman et al., "The Neurocognition of Developmental Disorders of Language," *Annual Review of Psychology* 71 (2020): 389–417, https://doi.org/10.1146/annurev-psych-122216-011555.

9. Benjamin O. Turner, Matthew J. Crossley, and F. Gregory Ashby, "Hierarchical Control of Procedural and Declarative Category-Learning Systems," *Neuroimage* 150 (2017): 150–161, doi: 10.1016/j.neuroimage.2017.02.039.

   In this article, I'm calling these pathways deliberative and automatic. But neuroscientists (like Michael Ullman) generally call these pathways declarative and procedural. The declarative pathway largely relies on the hippocampus, while the procedural pathway largely involves the basal ganglia. The advantage of the neuroscientific terminology is that it's clear what anatomical systems are being used by each pathway. So, when Turner et al, for example, discuss how the brain switches back and forth between procedural and declarative systems with the aid of the cerebellum in their study "Hierarchical control of procedural and declarative category-learning systems," we know exactly what neural systems are involved. But the neuroscientific terminology can be confusing for laypersons because sometimes psychologists (as opposed to neuroscientists) think of "procedural learning" as a step-by-step declarative process. Psychologists prefer the terms explicit and implicit for the declarative and procedural systems, respectively. The problem is that these psychological terms are often also used to describe conscious and unconscious processes without specifying the actual neural systems. Terminology can be a bear to parse!

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Exploring PLACE-BASED *Learning*

by
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The educational system should be designed to teach people about the world they live in, and how they fit in with that world, and hopefully give the students the tools to see how they can make contributions to that world. To accomplish that design, education must create interest and meaning in what is presented; otherwise, education provides experiences, but not educative ones.[1]

John Dewey

Before there were formal education systems, children learned through practical, hands-on experiences in various contexts, such as their homes, the woods close by, open fields, junkyards, and even in their parents' workplaces—which were then usually a part of their homes. By being in these different environments and actively participating in activities such as farming, cooking, craftsmanship, and household chores with their families and communities, they learned life skills. These skills were essential for their survival, livelihood, and overall well-being.

Place-based learning uses the surrounding community—including natural and cultural resources—as an extended classroom. It emphasizes connecting students with their local environment, neighborhood, and community and incorporates real-world circumstances into the learning process.[2] Learning opportunities embedded in local communities foster a sense of place identification, improved comprehension, and deep connections with the place itself. In essence, context matters.

In place-based learning approaches, children engage in real-world problem-solving, exploration, and experimentation. Because these approaches often take place outside of school, students encounter new information or need to make unplanned changes. This active involvement stimulates curiosity, critical thinking, and creativity, which are foundational aspects of "smartness." Additionally, through first-hand experience and exposure, children develop a sense of belonging and identity as they learn local traditions, values, and norms.

Place-based learning shifts away from the teacher-centered, passive-student pedagogical model toward active, engaged, and contextually embedded learning. It connects students to their local environment and community, making the learning experience more meaningful and engaging. In place-based learning experiences, by engaging with the world around them, students gain a broader perspective and develop critical thinking skills that extend beyond the confines of a classroom.

Case Study: Learning in the Parque das Neblinas

Our collaboration with Parque das Neblinas, a national park and a reservoir of the Rain Atlantic Forest, fostered in our students a deep understanding of the biome in which we reside and provided us with an excellent opportunity to implement place-based learning. In this project, students got to understand the role São Paulo—a city known for its constant growth and density—has played as part of the Atlantic Forest. Over the course of this project, students traversed the park's trails, immersing themselves in the forest's unique atmosphere. They studied native species of fauna and flora and concluded their exploration with a refreshing dip in the river. Immersing themselves profoundly in nature allowed these students to develop an understanding of the natural world and their role within this ecosystem. One of the students

stated: “This is a once-in-a-lifetime experience, everyone should try it. I will always remember what I learned from this…”

By actively engaging with the environment, students learned through direct experiences. They explored, observed, and interacted with the local environment, stimulating their curiosity and critical thinking skills. This hands-on approach fostered a deeper understanding of concepts and encouraged students to apply their knowledge in practical situations.

> ***“By actively engaging with the environment, students learned through direct experiences.”***

Learning at the park provided natural opportunities for students to make connections across various disciplines, as the environment encompasses multiple subjects, including science, history, geography, art, and more. Students could see the interconnectedness of knowledge and understand how different subjects intersect in the real world. This interdisciplinary approach enhanced the students’ ability to think critically, solve problems, and connect across different domains.

Students interacted with local experts, community organizations, and residents, fostering meaningful relationships. The connections students built with their community developed a sense of belonging and responsibility, which in turn promoted civic awareness, social responsibility, and empathy. In this project, students recognized that their learning can positively impact their community, leading to a sense of purpose and a desire to contribute.

For example, in the collaborative biome project with Parque das Neblinas, students experienced the wonders of nature first-hand and developed a deep appreciation for the natural world and an understanding of their role in preserving it. Inspired by their transformative encounter, the students felt compelled to share their experiences with others and encourage them to embrace the awareness of the biome to which they belong. They undertook the production of a national park visitor’s guide crafted by children for children. The visitor’s guide was made available to park visitors. The guide stood

out not merely because it was created by children but because it captured the unique views, colors, and intricate details that accompany the first-hand experience of nature. This student-led guide transformed the students into active participants in their learning by giving them the opportunity to share their understanding with the community.

When learning experiences are well-designed, place-based learning is an effective method to make kids smarter. This approach to learning enables students to understand and retain knowledge. Exploration, observation, and interaction with the environment stimulates students' curiosity and critical thinking skills. In this learning environment, there are plenty of opportunities to include student voice and choice into the curriculum, which helps enhance student engagement and motivation. Place-based learning also creates opportunities for students to engage with their community and form meaningful connections, which enables them to practice empathy and compassion. It allows students to understand and appreciate their communities and environments and cultivate a desire to build a sustainable future. By instilling these skills and qualities, place-based learning helps raise smart and well-rounded citizens. Whether as a visit to a small, local park or extended learning opportunities at a museum or art exhibition, or in an outdoor learning expedition, these experiences provide students with invaluable opportunities for growth, discovery, and authentic learning. Ed

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Cristina Oliveira has taught wellness and movement for the past thirteen years. She recently became a manager of afterschool activities at Avenues São Paulo.

Anne Baldisseri is passionate about building community, motivating people, and sustaining a culture where teachers and students learn together. Before becoming head of school, Anne served as Avenues São Paulo's founding head of the primary division.

David Palumbo is the founder of Education Accelerated, an innovative partnership bringing scale and momentum to some of education's most promising initiatives.

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The Myth of 3

MISTAKEN BELIEF

The first three years *of life*
are most critical *to* brain development
and one's trajectory is fixed *after that.*

THE FACTS

Adults can learn and grow, too.

The "myth of three" can be traced to an overgeneralization of the concept of critical periods in learning.[1] Critical periods have been mistakenly understood—just because there are specific times in development when brain regions are associated with specific skills (such as language acquisition), that does not mean these skills cannot be learned outside of these periods. Because a child's brain (age zero to three) is less developed, there are actually more synaptic connections than in an adult brain, which has pruned away or abandoned connections that are not useful in a given environment or context. Brain plasticity may be heightened during this early development, but it does not disappear in fully developed adult brains.

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Playing for KNOWLEDGE

Unlocking the Joy of Learning

BY AMANDA DELGADO, ANNELISE PESCH, ROBERTA MICHNICK GOLINKOFF, KATHY HIRSH-PASEK

Children spend nearly 80 percent of their waking day outside of formal schooling environments.[1] For many children, this includes community spaces like parks, public transportation, laundromats, grocery stores, and other areas in the community.[2] What if children's time spent in the community with their families fostered early learning and critical life skills? What if caregivers could foster conversation and language skills with children while picking tomatoes at the grocery store? What if the architecture of bus stops was infused with STEM games and hidden patterns that would support later mathematical learning?

Since access to informal learning experiences[3] and high-quality language interactions[4] significantly impact academic achievement, family interactions in everyday community spaces offer ways to increase access to early learning experiences that predict later academic outcomes. The Playful Learning Model (PLM)—and the Playful Learning Landscapes projects that have emerged from it[5]—can provide support for children on their journeys to academic success and personal happiness. This approach can also be used in schools; there is a large experiment underway in four cities in the United States to test whether it can improve children's and teachers' school lives.[6] Finally, this approach can be applied to improve formal schooling and educational technology, which is increasingly a part of children's lives.

The Value of Playful Learning

Playful learning provides invaluable opportunities for children to explore, practice basic skills, and experience joy. Play engages children cognitively and physically and contributes to their social and emotional well-being[7] as well as their academic skills.[8] It helps them discover who they are and what they like.

Playful learning also provides educators with a pedagogical framework.[9] We conceptualize play as a continuum from free play to guided play to direct instruction. Free play is an experience that is child-directed and child-initiated and that does not have a learning objective. This is what we think of when we use the word play: children acting either with others or solo to experiment, explore, and pretend. By contrast, there is a clear learning goal in direct instruction. It is adult-directed and adult-initiated, which removes children's agency. In the middle of the continuum, there is guided play. In guided play, children direct their learning while an adult subtly guides them toward a learning goal or creates a planned, tailored environment.[10] Guided play outperforms both free play and direct instruction as a superior approach for children to acquire a wide range of skills, including mathematics and language skills.[11] There are other advantages of guided play in various domains including problem-solving,[12] early

language and literacy skills,[13] math skills,[14] and the promotion of spatial and math talk.[15]

The Playful Learning Model and Playful Learning Landscapes

The Playful Learning Model (PLM) is a three-part equation that leverages cultural values, the how of learning, and what children need to know to thrive

in the 21st century.[16] The PLM ultimately fosters academic success for all children by incorporating playful learning into the design of formal and informal learning spaces where children spend time. Activities that intentionally incorporate these pillars provide ripe opportunities for children and families to engage in playful learning in a variety of community contexts.

Playful Learning Landscapes (PLL) encourage these types of interactions by transforming public spaces into playful learning opportunities. Community engagement is an essential component of the PLM and design of PLLs. When community voices are prioritized and valued, informal learning opportunities become more meaningful and impactful,[17] in turn generating more high-quality interactions and conversation.[18] Connecting home, school, and community environments helps leverage the funds of knowledge that students bring into their education and supports learning across contexts.[19]

Thus, the first step in prioritizing community values, practices, and funds of knowledge is to co-design playful learning activities with community leaders and stakeholders. The second step is an iterative process that combines community designs with the science of how children learn best. Research studies show that children thrive in learning environments that are active, engaging, meaningful, socially interactive, iterative, and joyful.[20] Indeed, these are the same characteristics that demonstrate how the human brain learns best.[21]

Finally, the PLM helps create PLLs that are infused with intentional learning goals that address what children should know. The six C's—collaboration, communication, content, critical thinking, creative innovation, and confidence—offer a scientifically vetted set of skills that build on each other to prepare children for a lifetime of learning.[22] Although traditional academic content knowledge (such as mathematics, literacy, social studies, and science) is important, it does not guarantee personal or professional success. Growth in the six Cs is related to the developmental outcomes that are crucial for both academic success[23] and are desirable characteristics in an evolving workforce.

Playful Learning Landscapes in Action

PLLs are flexible and inclusive, and they can reach a range of diverse communities and contexts. One project in California (Figure 1) illustrates the PLM well. Nearly fifty caregivers signed up in 2020, at the height of the COVID-19 pandemic, to participate in

a series of online, facilitated co-design workshops. Sessions provided space for caregivers to discuss values and practices important to them and art supplies allowed families to visually express their design ideas (Panels A, B, and C). Caregivers expressed that it was important for the activities to feature *familismo*, intergenerational learning, Spanish and English text, and artwork celebrating diversity. These ideas led to the creation of several PLL prototypes, including an abacus bus stop and lotería park game (Panel D).

Together, the research team and the families ensured that designs reflected community values while incorporating the pillars of learning and six C learning goals through ongoing community design sessions (Panels E and F). This process shows how communities can be involved throughout the design process while upholding other important design principles based in the science of learning.

In Philadelphia, another PLL installation—Urban Thinkscape—reflects local community values in its location and artwork (Figure 2). When community members were approached with the idea, they voiced their desire to place playful activities in a community space that held cultural and historical value. This resulted in the transformation of a bus stop on the very lot where Martin Luther King, Jr. gave a speech in 1965.[25] Puzzles used in that installation contained meaningful images (for example, a portrait of Martin Luther King, Jr.). The activities were also grounded in science, supporting early learning through play. For example, the "puzzle bench" (Figure 2) supports the development of spatial skills; similarly, "jumping feet"—a riff on hopscotch—prompts children to practice critical executive functioning skills. "Stories" encourages narrative skills, while the "hidden figures" piece was designed to spark conversation about shapes. All of this is essential to later academic success.[26]

The PLM can also help foster children's learning and bring joy to educators in early childcare settings. According to the Department

Figure 1 The PLL design process.[24] Community values and practices are elicited through co-design workshops (A, B, and C). Co-design workshops inform initial prototypes (D), which are then taken back to the community for continued feedback (E and F). Communities are involved throughout the design process, while upholding other important design principles, including the pillars of learning and six C skills.

Figure 2 Urban Thinkscape, a reimagined bus stop that supports playful learning.[27]

of Education, 63 percent of children ages three to five years are enrolled in some form of pre-kindergarten care in the United States.[28] At the same time, teacher turnover rates are higher in early childhood education (ECE) compared to K through 12 institutions,[29] a concerning trend given the established benefits of high-quality ECE on children's later academic success.[30] Implementing the PLM holds promise as a way to bring joyful learning experiences to ECE that center educator voices, build community, and support the development of skills children will need for kindergarten and beyond.

A new partnership with a leading ECE provider has provided our team with the opportunity to implement the PLM in several childcare centers located in Philadelphia, Pennsylvania. As is central to our model, our process began by working with educators and center directors from each center to co-design playful learning installations. Over the course of several co-design sessions, educators identified fundamental values, practices, and learning goals central to their community and context, which differed based on location (e.g., urban vs. rural). They also curated ideas for activities to support target learning goals that reflected the pillars of learning.

Although similar learning goals—such as letter identification and number recognition—were identified by all six participating centers, center-specific features emerged. For example, center directors, caregivers, and educators from one center expressed their desire to have Judaic values and images embedded in their center's activities. Those from a different center voiced that depicting homelessness with positive messaging was essential

due to their proximity to homelessness in the city. Thus, while both centers are located in Philadelphia, our model's emphasis on community co-design resulted in the creation of playful installations that celebrate the unique identities of each center while also supporting early language and mathematical learning (see Figure 3). Evaluation of children's academic outcomes and teacher-child interactions will provide important data regarding the benefits of playful learning in ECE.

Reimagining Informal Learning in Community and Educational Spaces

The PLM allows for crafting high-quality and impactful learning experiences in public community spaces and early childhood education centers, empowering families and educators alike. By merging community values with the science of how children learn best and with what children need to learn to succeed, the PLM can create accessible physical spaces that embrace both education and joy—or, PLLs.

PLLs support early learning skills critical to later academic achievement and offer a safe and beautiful addition to kid-friendly cities. Researchers observed more conversations and higher-quality caregiver-child interactions at Urban Thinkscape as compared to a nearby park.[31] Observations of caregiver-child interactions at PLLs in other spaces—like parks, libraries, and grocery stores—report the same pattern of findings.[32] Taken together, this growing body of research provides evidence that children benefit from these informal learning opportunities when the three key components of the PLM model are reflected.

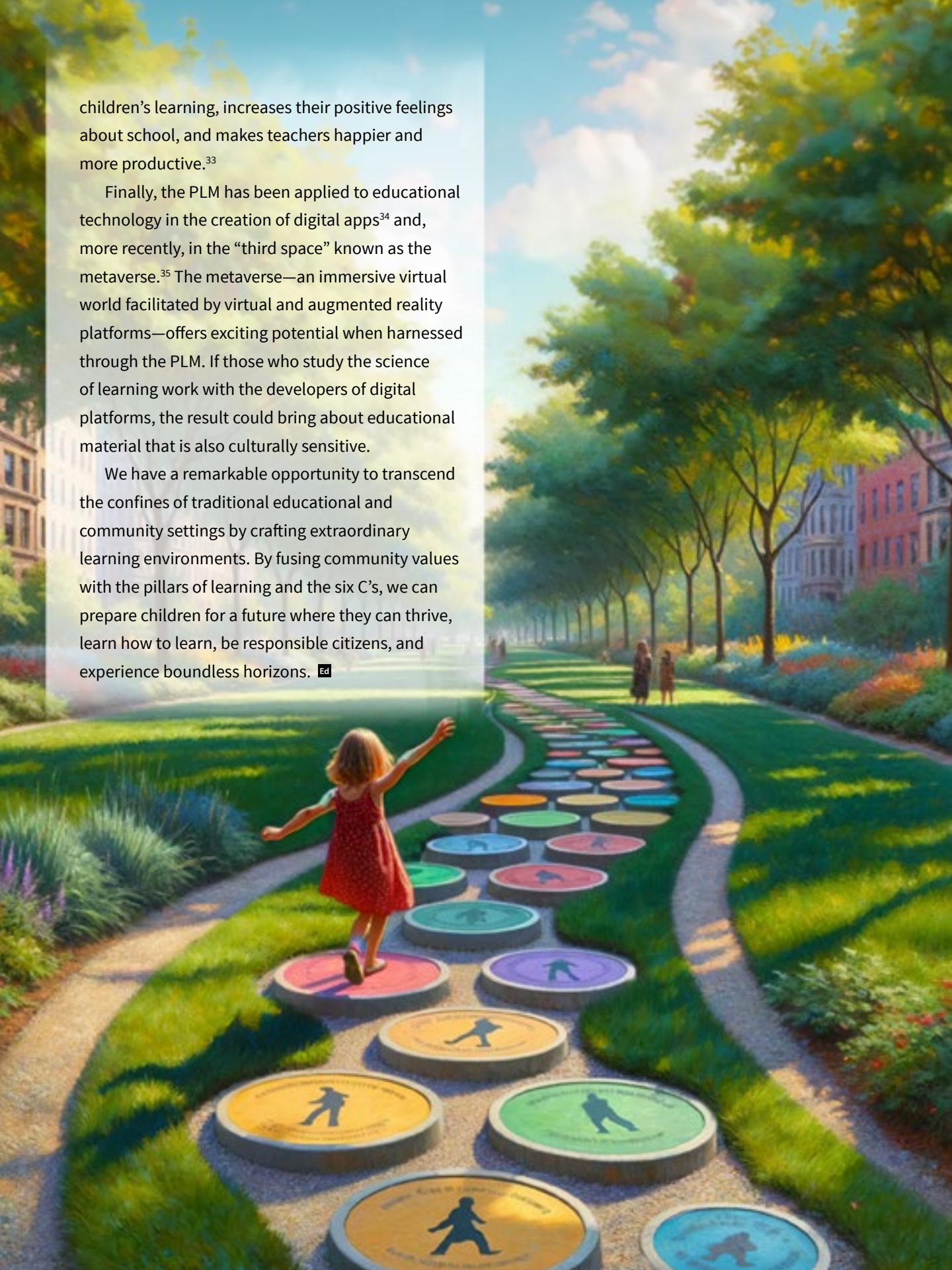
As the PLM continues to expand to new sectors, it holds the potential to inform curricular design and pedagogical practices in formal educational institutions. Currently, our team is collaborating with a school district in Michigan and with the State of New Hampshire to embed playful learning practices in the classroom through teacher coaching. Preliminary findings from this research project suggests that playful learning improves

Figure 3 Mural installations co-designed with educators for early childhood education classrooms in Philadelphia. The murals were specifically created to prompt discussion about literacy, language, and numbers. Artwork by Tal Bavli.

children's learning, increases their positive feelings about school, and makes teachers happier and more productive.[33]

Finally, the PLM has been applied to educational technology in the creation of digital apps[34] and, more recently, in the "third space" known as the metaverse.[35] The metaverse—an immersive virtual world facilitated by virtual and augmented reality platforms—offers exciting potential when harnessed through the PLM. If those who study the science of learning work with the developers of digital platforms, the result could bring about educational material that is also culturally sensitive.

We have a remarkable opportunity to transcend the confines of traditional educational and community settings by crafting extraordinary learning environments. By fusing community values with the pillars of learning and the six C's, we can prepare children for a future where they can thrive, learn how to learn, be responsible citizens, and experience boundless horizons. Ed



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PLAYFUL LEARNING

IN HOMES, SCHOOLS, AND BEYOND • A GUIDE • BY JENNIFER M. ZOSH AND BRENNA HASSINGER-DAS

As the pressure mounts to narrow long-standing achievement gaps and compensate for pandemic-related learning loss, parents, teachers, and school administrators have expressed feeling the need to "get serious" when it comes to education. Too often, we hear about recess and art or music classes disappearing and a hesitancy to embrace play at home or in classrooms.

But did you know that playing can help children become smarter? The science of learning suggests that human brains learn best when children are active and engaged (not distracted), and when learning is iterative (allows experimenting in open-ended ways), meaningful (connects to existing knowledge or interests), and socially interactive (with adult caregivers or peers).[1]

Research studies also point out that joy (positive affect and/or moments of surprise or accomplishment) is a critical motivator for learning.[2] Play naturally leverages these characteristics. And yet play is often untapped as a viable learning method, especially among older children. When linked to concrete learning goals, families, teachers, and school leaders can use playful approaches to help support the complex challenge of making kids smarter and preparing them for an uncertain future.[3]

At right are some tips for facilitating playful learning to support the development of cognitive, creative, and executive function skills at home and at school. Infusing everyday spaces and places with opportunities to learn joyfully and playfully is not just a bonus moment—it is a whole-hearted embrace of what the science of learning has revealed about how humans learn. Ed

Brenna Hassinger-Das is an Associate Professor of Psychology at Pace University. Her research investigates the effects of play and digital media on caregiver-child interactions and child learning. She is committed to translating her research for use by the public through community-based research projects, blog posts, and commentaries featured in outlets such as *The Conversation*, *The Huffington Post*, and other local platforms.

Jennifer M. Zosh is a Professor of Human Development and Family Studies at the Brandywine campus of Penn State University. Her research areas include cognitive development, playful learning, and the impact of technology on children and families. A major driving force in her career is the dissemination and translation of scientific discoveries for the public via writing, speaking, and training.

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USE GUIDED PLAY TO MEET LEARNING GOALS

Guided play is a technique in which adults help establish learning goals—for example, teaching vocabulary, mastering subtraction, or exploring the season. After goals are established, activities are created with those goals in mind that naturally engage and support children in play.

LISTEN, LEARN, AND LEVERAGE NATURAL INTERESTS

We've all been in the situation where we find an activity or a subject matter that fascinates us—one in which we become engaged and, before we know it, an hour or more has passed. As adults supporting children, it's important to take the time to allow children to explore and find their own interests and then to encourage those in playful ways that happen organically.

GIVE CHILDREN AGENCY

Guided play should give children freedom to decide how to play, create, and learn. Adults are present to facilitate a playful and fun experience that supports learning goals, but they allow children (and their brains) to get to work (and play!).

CREATE INTERACTIVE AND COLLABORATIVE GUIDED PLAY EXPERIENCES

Socially interactive guided play fosters collaboration and engagement. Children can learn from each other and stay on task longer when guided play activities promote productive peer interaction. Socially interactive guided play settings also help children learn to collaborate, regulate their emotions, and solve conflicts.

PLAYFUL LEARNING ANYWHERE, ANYTIME

Playful learning isn't limited to an expensive toy or the latest tech innovation. It can happen anywhere: at home, school, a bus stop, the supermarket, the waiting room, the woods, the car, the playground, the lunchroom, and so on. Further, playful learning doesn't have to be an hour-long experience. Consider quick ways to support numeracy at the supermarket (counting fruits), literacy at lunch (naming foods starting with each letter), executive functioning in the hallway (only stepping on certain colored tiles), collaboration in a waiting room (working together to build a tower out of blocks), and even creativity at a bus stop (telling fantastical stories about adventures that could happen at the end of the ride), among many other natural opportunities for playful learning.

EMBRACE THE MESS, NOISE, AND GIGGLES

We've heard about teachers who are afraid to get in trouble because their classrooms are too loud; some parents say that they send their children to school to learn, not to play. But children naturally learn about the world through play. Children pretending to run a grocery store checkout line with their friends are far from quiet. Before asking them to be quieter, listen to what they're saying and watch what they're doing. You'll likely notice them practicing skills including math (counting, adding, subtracting, sorting), literacy (making and reading signs), communication, and executive function (waiting in line, role-playing, turn-taking). Learning is exciting for young children, so it's best to support, rather than stifle, that natural excitement.

IMPACT *of* MOVEMENT *on* COGNITIVE DEVELOPMENT *and* ABILITY

Engaging in physical activities enhances a variety of cognitive processes that are essential for learning, such as attention, concentration, self-regulation, and cognitive flexibility. Importantly, aerobic exercise (activity that increases breathing and the heartbeat for an extended period) has a greater impact than exercises that focus solely on flexibility or strength. For this reason, when discussing physical activity here, we are specifically referring to moderate-to-vigorous aerobic activity.

One ten-minute period of exercise has been shown to increase cognitive performance, but more consistent exercise likely results in more significant, longer-lasting benefits to cognitive function.

Students who are physically active for at least ten minutes per day often show improvements in short- and long-term memory retention and recall.

Regular exercise has been linked to increased brain volume, particularly in regions associated with memory and learning.

Children who engage in frequent physical activity tend to exhibit better self-control and social behavior and fewer disruptive behaviors, creating a conducive learning environment for everyone. This can help address behavioral and attention-related challenges such as Attention-Deficit/Hyperactivity Disorder.

Regular physical activity reduces stress and anxiety by releasing endorphins in the brain, which are natural mood lifters. This helps increase student well-being and create a positive internal and external environment for learning.

Consistent exercise enhances executive functioning skills, such as self-control, working memory, and cognitive flexibility, leading to better decision-making and impulse control. These skills are crucial for success in school and life.

Regular physical activity often leads to improved sleep quality. Sufficient and restful sleep is essential for cognitive consolidation, memory formation, and overall brain health in children and adolescents.

PRACTICAL MOVES

Exercise Early
Give students opportunities to exercise early. Exercise in the morning or mid-day (before learning opportunities) is preferable to exercise later in the day or after school.

Regular Physical Activity
Ensure students have activity sessions of at least ten minutes each during the week. These can be physical education classes, recess, or extracurricular aerobic sports programs.

Classroom Movement
Incorporate movement into classroom activities. Allow students to stand, stretch, or walk around during lessons, promoting active engagement and enhancing focus.

Rest and Recovery
While physical activity is crucial, ensure students also have adequate rest and recovery time. Overexertion without proper rest can lead to fatigue and hinder cognitive function.

Understand Differences
Understand that every child is different. Avoid a one-size-fits-all approach to physical activity. Cater to individual preferences and abilities, ensuring all can participate comfortably.

EAT SMART

The IMPACT *of* NUTRITION

Well-balanced nutrition positively affects cognitive abilities such as memory, attention, and problem-solving skills. A balanced diet ensures that the brain receives the energy and nutrients it needs for optimal development and performance. Nutrients like omega-3 fatty acids, vitamins, and minerals support brain growth and function.

HOW IT HELPS

Breakfast

A balanced breakfast, including protein and whole grains, jumpstarts the day and improves attention, focus, and academic performance. Children who eat breakfast regularly demonstrate better problem-solving skills and increased participation in class.

Omega-3

Foods rich in omega-3 fatty acids, such as fatty fish and flaxseeds, are linked to improved memory, attention, and problem-solving skills. Including these foods in kids' diets positively impacts cognitive development.

Sugar

Minimizing sugary snacks and drinks prevents rapid spikes and drops in blood sugar levels. Stable blood sugar promotes consistent energy, sustained focus, and better concentration throughout the school day.

Healthy Snacks

Favoring healthy snacks, such as fruits, nuts, and yogurt, over sugary or processed snacks gives kids sustained energy and prevents energy crashes, helping students stay focused and alert throughout the day.

Habits

Establishing healthy eating habits during childhood and adolescence can have long-term benefits. It reduces the risk of chronic diseases, supports lifelong learning, and contributes to overall well-being in adulthood.

Hydration

Staying hydrated is essential for cognitive function. Dehydration can impair concentration and cause fatigue.

WHAT SCHOOLS CAN DO

All-Day Nutrition

Provide a nutritious, balanced breakfast and low-glycemic index snacks throughout the day. Low-glycemic foods can have positive effects on sustained attention and memory.

Curriculum Integration

Integrate nutrition education into the curriculum, teaching students about the importance of healthy eating and how it positively impacts their learning and overall well-being.

MISTAKEN BELIEF

We only use 10 percent *of* our brains.

THE FACTS

The whole brain is constantly in use.

This myth is propagated in two ways: the popularization of functional magnetic resonance images (fMRI) and the marketing of early "brain training" apps.

When fMRI scans are analyzed, the image shows discrete areas in bright color, while the rest of the brain is colorless. This gives the impression that only those areas are active during given tasks. But what's really happening in the analysis is the subtraction of a baseline of brain activation. Those specific areas are significantly more active than the rest of the brain during that specific task, meaning they are indeed primarily involved with the task being studied. However, this does not mean the rest of the brain isn't being used. It's more accurate to think of discrete tasks being associated with activation patterns throughout the brain, as opposed to one or two specific regions.

The second origin of this misconception—brain training pitches—suggested that apps could tap the brain's unused potential. This idea is further amplified in popular culture. Movies and television often depict, for example, a magic pill that opens up the unused 90% of a character's brain, unleashing incredible power.

The truth is, we use all of our brains all the time.[1] Specific regions are certainly more active or less active than others during specific cognitive tasks, but that doesn't mean other parts of the brain are just sitting idle.

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CREATING

Cognitive Trailblazers®

How to Empower Students to Overcome Biases and Solve World Problems

by Charles G. Xavier

Imagine you're out for a hike and you discover a forest untouched by humankind. You need to get to the other side. You see a few points of entry that seem to provide comfortable access to the forest and appear easier than others. You'd naturally prefer using these entry points, but even so, your first trip through the forest will be slow and careful—walking where it is easiest, stepping over fallen trees and around bushes. As you return to the forest and continue to use the now familiar path, it becomes more established. You likely abandon some portions of your path in favor of easier, faster routes. Over time and with repetition, a clear hiking trail emerges. Now getting from point A to point B is faster and requires less energy. This kind of literal trailblazing is similar to the process of learning.

Novel tasks require new connections, new pathways, and more energy than those previously established. The human brain adapts to meet the demands of diverse and dynamic contexts, resulting in a powerful problem-solving apparatus that requires significant amounts of energy. Because of this, the brain defaults to taking the route that requires the least amount of energy. The ability to automate familiar processes and adapt to new demands is a superpower of the human brain. Understanding how this ability helps and hinders our thinking, our problem-solving, and our decisions is a fundamental step toward understanding how to make kids—and all humans—smarter.

The term "cognitive miser" is often used to describe the brain's energy-saving tendency to default to low-power, low-energy-expense cognitive processes.[1] The tendency to be a cognitive miser is adaptive. The brain's instinct for energy conservation is thought to be an evolutionary benefit that served our ancestors. From this perspective, it is no surprise that the brain is habituated to minimize the expense of energy and is uniquely able to identify the most energy efficient ways to accomplish a task. Using less energy for one task means that there is more energy left for a subsequent task.

Mental shortcuts that facilitate quick and efficient decisions are called heuristics. Heuristics develop from our inclination to be cognitive misers, and they often lead to fluency and efficiency in cognitive systems. In fact, we see the benefits of heuristics every day. Driving a car and reading the words on this page are both examples of the benefits of our brains using shortcuts to conserve energy. However, the reliance on default cognitive systems sometimes leads to an overuse of heuristics, which can result in mistakes in judgment, decision-making, and problem-solving.

These unconscious errors, which are made as a result of heuristic processing, are called cognitive biases. In this article, I summarize and explore two fundamental cognitive biases—confirmation bias and tribalism—and trace them from contexts in which they were once beneficial through the ways in which they now interfere with decision-making in modern contexts.

In a world polarized into a multitude of "us/them" relationships and an overload of information with varying degrees of reliability, cognitive biases are serious obstacles to humans' ever-increasing need to acknowledge and solve global-scale problems. Providing future generations with the skills and knowledge to resist these familiar patterns will allow them blaze new and unexplored trails through figurative forests, make better decisions, and exercise better judgment as they sift through the plethora of information available to them.

Confirmation Bias

Confirmation bias is the tendency to seek out, interpret, favor, and recall information in ways that confirm our preexisting opinions, beliefs, and hypotheses.[2] In other words, confirmation bias is a mistake in the way we seek and interpret new information after we have already established a belief. We tend to overvalue information that supports our current beliefs and—even when presented with compelling evidence to the contrary—these beliefs are resistant to change. Certain behavioral patterns highlight our natural tendencies to test our ideas in an automatic, one-sided way, not putting forth the full effort required to investigate in an empirical, rational, and unbiased way.[3] These are shown in the table opposite.

Confirmation bias can have a significant negative impact on our thought processes. While

PATTERNS OF CONFIRMATION BIAS

RESTRICT ATTENTION TO A FAVORED HYPOTHESIS

We tend to analyze information through the lens of a favored hypothesis and fail to give appropriate consideration to alternative explanations.

PREFER EVIDENCE SUPPORTING EXISTING BELIEFS

We tend to assign greater value to information that supports our existing opinions than to information that contradicts them.

LOOK FOR POSITIVE CASES

We actively seek confirming evidence even when we do not believe the specific hypothesis. In other words, when we are considering an idea, we tend to locate and identify information that supports that idea, which in turn strengthens our belief in its accuracy.[4]

OVERWEIGH POSITIVE CONFIRMATIONS

We tend to overvalue evidence that confirms or is consistent with a given statement or position and undervalue information that contradicts a given statement or position.

SEE WHAT WE ARE LOOKING FOR

We see patterns that we look for, whether or not those patterns are actually there. If we are primed to a specific outcome, we are more likely to see evidence, trends, and patterns that signify the expected outcome. One of many examples is the "halo effect," a common phenomenon in educational settings. When a teacher already has positive impressions of a student, they tend to assess that student in a more positive light.[5] Likewise, the use of labels with students (for example, low ability, slow, low SES, gifted) may lead teachers to alter their expectations and instructional strategies.[6]

"... cognitive biases are serious obstacles to humans' ever-increasing need to acknowledge and solve global-scale problems."

it may seem as if we are being deliberate and conscious in our processing, human cognition uses shortcuts to avoid the energy-taxing task of critical analysis. What follows are two examples in context.

The symbols adjacent to the examples below refer to the behavioral patterns described in the table (preceding page).

Example 1: Teachers

A student is struggling to stay on pace with the rest of their math class. The teacher has seen this before and knows that attention deficit/hyperactivity disorder (ADHD) has caused similar struggles in the past. With this favored hypothesis in hand, the teacher may tend not to consider other potential explanations—such as dyscalculia or lack of motivation, for example. The teacher learns that the student in question was assessed for ADHD the previous year and was not given a diagnosis. But the teacher discards this contradictory evidence outright or rationalizes it in a way that leaves the ADHD hypothesis intact.

Then, the teacher shares their ADHD hypothesis with a colleague. This colleague observes the student more closely and sees what looks like a lack of focus as well as unfinished assignments. Because these are indicators of ADHD, the second teacher also begins to believe the student has ADHD without looking for contradictory evidence. The teacher comes to see the student's lack of focus and unfinished assignments as evidence of their existing belief. The teacher subconsciously puts a higher value on this evidence of ADHD, without giving the previous assessment for the disorder equal value. The teacher feels a psychological confirmation of their belief even if it is not a logically sound conclusion.

Example 2: Students

In science class, students are learning about climate change. One student does not believe that climate

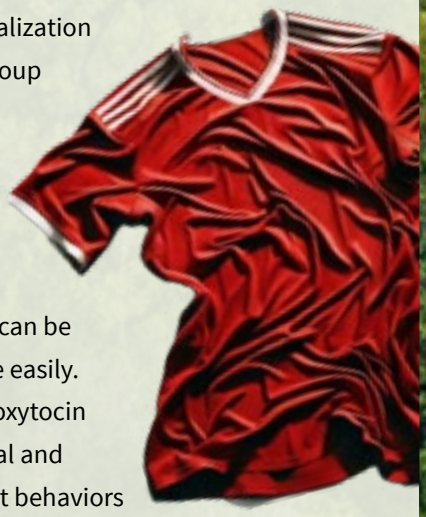
"... human cognition uses shortcuts to avoid the energy-taxing task of critical analysis."

change is a problem. The student has heard and believes that the earth has always gone through phases of warming and cooling temperatures. Because of this favored hypothesis, the student does not consider other potential explanations. They focus on historical climate data showing rising and falling temperatures and dismiss information about the magnitude of the temperature differences the earth is currently experiencing.

The student then identifies recent days or periods of the year that were not significantly warmer than the historical averages. They see significant snow and ice storms as evidence that the climate is not getting warmer in a problematic way. The student puts higher value on these seemingly relevant data points and disregards facts such as how icecaps are melting at unprecedented rates or how new all-time highs for temperature are being reached on a consistent and alarming basis. Because this student is primed to see normalcy in the way the climate is shifting, they see similar shifts and patterns in historical climate data—even if and when those patterns are not there.

Tribalism

Tribalism, at its core, helps people identify who is safe to cooperate with and who is not. There are clear benefits to cooperation from an evolutionary perspective. Biologically, humans are designed to cooperate with their genetic relatives through a process called kin selection,[7] an evolutionary strategy that favors the reproductive success of an organism's relatives or to continue the genetic lineage.[8] Kin selection is well established in most mammal species and may be the primary evolutionary source of human tribalism. However, the overgeneralization of this instinct in inappropriate contexts results in significant errors of judgment and is often referred to as in-group/out-group bias. Conflicts between nations, members of different religions, and even fans of different sports teams are all examples of the natural overgeneralization of in-group/out-group bias. The brain is predisposed to see the world in tribal terms and, as we will see, the tribes it identifies can be manipulated quite easily.



The hormone oxytocin facilitates prosocial and socially competent behaviors in animals and humans, such as the parent-child bond formation, enhanced trust and social affiliation,[9] and cooperation and generosity.[10] Oxytocin enhances our social competence and cooperative behaviors toward people in our own group (in-group members), while decreasing our prosocial behaviors toward people outside our own group (out-group members). For example, oxytocin enhances trust and cooperation during economic games, but only when playing with people we know. When playing with people with whom we are unfamiliar (out-groups), oxytocin will undermine cooperation.[11]

Emotions also help determine with whom we cooperate. Some of our emotional reactions developed as a way to convince our otherwise uncooperative ancestors to cooperate for the good of propagating our genetic material.[12] Emotions such as empathy, love, social disgust, friendship, gratitude, vengefulness, honor, shame, guilt, loyalty, humility, self-consciousness, and embarrassment make up the psychological (and moral) machinery

that drives cooperation. Emotion-driven tribal cooperation is intuitive. Cooperation does not require reason and logic.

Tribalism operates in an emotional, subliminal, and automatic way. Many studies have shown that if a white person is shown a black face at subliminal speed, the amygdala—the part of the brain associated with processing emotions such as anger, fear, and aggression—activates.[13] This activation indicates an emotional reaction to an out-group member before conscious thinking can happen. Similar reactions, at approximately the same speed, have been observed from gender and social status.[14] While these precognitive reactions were seen in children as young as nine months, it is important to note that this is a function of familiarity and not one of innate racism: children will be more familiar with what their parents look like. Further, tribalism along race lines are usually the weakest of tribal distinctions, as they quickly break down when other variables are introduced (for example, cheering for a specific sports team).[15]

We form in-groups and out-groups quickly and through arbitrary distinctions—or, through superficial differentiating characteristics that hold no significance in and of themselves until classical conditioning collides with these subjective indicators.[16] For example, in the 1970s, Henri Tajfel and colleagues examined the minimal conditions required for discrimination to occur between groups.[17] They found that even when groups were formed based on artificial differences (such as whether a person overestimated or underestimated during an estimation task), in-group biases developed rapidly, even when the randomness of group assignments were made explicit to the participants.[18] These arbitrary symbols gradually become the very things that they

“… our ability to solve problems and our ability to make decisions are impaired by tribalistic thinking.”

initially symbolized: think, for example, of the way sports fans treat their favorite player's jersey when the player goes off to play for a different tribe,[19] or how people get up in arms about a specific color pattern that makes up their nation's flag.[20] While these symbols are superficial and flimsy, issues arise when they become the real, meaningful, and deeply embedded identities they represent.

Tribalism is linked to confirmation bias because it affects the way we think. However, tribalism is not just another form of confirmation bias. Tribal tendencies rear their power after we have established an opinion, belief, or hypothesis while eschewing the real work of deliberate, conscious thought. It is only once we've reacted tribally that our miserly tricks of confirmation bias swoop in to rationalize, strengthen, and confirm these beliefs. Confirmation bias acts as a post-hoc justification mechanism for these a priori tribal instincts. Further, this bias also helps us maintain and perpetuate these misconceptions—the tribalistic status quo.

Tribalism is rampant in the way we think. But how is it impeding humans' ability to be smart? First, in our modern, globally connected world where we need many different actors to come together to solve huge, complex problems, it is a fatal obstacle if we are unwilling to cooperate with someone because of the color of their shirt, the way they estimate, or the hand they prefer to write with.

Second, and more directly related to an individual's smartness, our groups do not only shape who we are and what we do; they also shape our perception of objective facts. In other words, our ability to solve problems and our ability to make decisions are impaired by tribalistic thinking. This was demonstrated in a study in which two deliberately divided groups of teenage boys were gathered in a classroom. Each boy was given a cup with beans in it. Each boy took turns dumping their beans onto a projector and everyone in the room estimated how many beans that boy had. It was found that if the boy was in their group, the boys overestimated the number of his beans. If they were in the other group, the boys underestimated that number. Everyone had the same number of beans. Our cognitive abilities are impaired when we are in an in-group/out-group state of mind. Overcoming this habit of mind is vital to making kids smarter.

Implications

We can overcome the tendency to be cognitive misers (overusing automatic, cognitive heuristics and falling victim to our own cognitive biases). We can instead be cognitive trailblazers, forging new paths and habits when beneficial.

To start, we must shift our perspective about knowledge away from a categorial, yes/no framework and toward one of rapid, incremental updates.[21] Doing so requires a continuous critical awareness of ourselves and our certainties. We must eliminate fears of unexplored territory, embarrassment about taking occasional wrong turns, and hesitance to strike out in a new direction if and when evidence leads that way. In order to accelerate our cognitive adaptation to modern social environments, we must consistently evaluate cognitive paths we take with critical vigilance.

What does this mean for educational environments? How do educators facilitate this shift in the ways students are thinking and knowing? What follows are some recommended practices that can be implemented in educational contexts to potentially overcome detrimental cognitive tendencies and achieve these outcomes with our students. These interventions, if applied consistently over time, can facilitate a necessary

shift away from binary, categorical, and zero-sum perspectives to a perspective of incrementally updating existing beliefs based on new information.

Create explicit lessons on cognitive biases and the strategies to overcome them. We must shift student thinking away from dichotomies and zero-sum outcomes toward consistent and constant updating of their opinions and thoughts based on relevant information. Opinions have a degree of belief; changing that degree of belief in the face of new information becomes an integral and expected part of having opinions. Being wrong about something shifts from being embarrassing, shocking, and unacceptable to undergoing a requisite process of learning, reasoning, and making decisions.

Conduct critical analysis of tacit knowledge and implicit perspectives. We must encourage students to repeatedly and explicitly challenge their own deep-seated beliefs and perspectives by presenting them with alternative explanations, different accounts, and new information to help them become comfortable changing their minds. Such flexibility is essential to overcoming tribalism and confirmation bias and to thinking more clearly.

Identify parallels and congruities between seemingly disparate ideas. Actively searching for similarities in people and ideas that, at first glance, seem strange or unfamiliar will help students break through the tribal gut reactions and allow for more deliberate cognition.

Craft opportunities for perspective-taking practice. Using writing activities or role-playing scenarios, educators must facilitate students' internalizing of contrary, alternate, or simply unfamiliar perspectives and points of view. This helps bridge the gap between the way "we" think and the way "they" think, breaking down tribal barriers.

Question beliefs, opinions, and ideologies. Seeking the quirks or dissonances with the people, ideas, or opinions that are familiar or held in high esteem provides students with opportunities to update their beliefs, critically examine them, and resist the miserly pull of accepting familiar, routinized thoughts.

Use deliberate practice to replace negative tendencies. The establishment of a new default, automatic cognition calls for persistence, patience, and repetition. Sustained interventions in formal educational settings have the unique opportunity to train these cognitive systems when they are most flexible. These strategies and adjustments must permeate through all facets of our educational environments in order to drive the evolution we want to see. Deliberate practice in overcoming instinctual grouping choices and behaviors associated with confirmation bias will reinforce new, more productive, and smarter cognitive processes.

Use stories to address cognitive biases. Stories can be designed to address specific biases and miserly tendencies. They can implicitly teach cognitive trailblazing skills and overcome implicit cognitive biases. The power of narrative has long been recognized in the search for understanding human

behavior and thinking, sparking an entire field with this specific goal: narrative psychology.[22] Stories allow us to address our inclination to be cognitive misers and the biases that stem from this instinct with students who are too young to benefit from explicit identification of these biases. For example, the book series *Neurofables: Interactive Stories to Build Better Brains*—the first volume of which I authored—is a start in this area. These deliberately crafted stories introduce the concept of a specific cognitive bias through familiar animal allegory and then transfer that concept into contexts relevant to young learners, all while facilitating deliberate practice and exploration of if/then thinking through a choose-your-own-adventure format that leads to students overcoming cognitive biases and developing new, smarter thinking habits. Ed

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Type 1

heuristic processing

RAPID + AUTOMATIC
reactive process in response to familiar stimuli

ENERGY + TIME EFFICENT
no conscious effort for the thinker

APPROXIMATION
facilitates fast, low-effort decision-making

ERROR + BIAS PRONE

DUAL

Cognition and decision-making are carried out by two distinct kinds of thinking known as Type 1 and Type 2 Processing. Understanding how these two types of thinking work—including when and how they interact—can help make kids smarter, inform better instructional strategies, and shed light on how metacognitive tasks (such as regulating emotions and strengthening focused attention) are performed. Moreover, with these research-based frameworks, educators and families can better target the development of specific cognitive skills or processes. For example, in order to overcome implicit biases in thinking, we must rewire Type 1 processes. By contrast, to develop critical thinking skills, we must rely on Type 2 thinking.

Examples facial recognition ▪ emotional responses ▪ associative and implicit learning

PROCESSING

Type 2

Examples

conscious problem-solving ▪ purposeful reasoning ▪ suppression of automatic cognitive responses

MISTAKEN BELIEF

Intelligence is *fixed, inherited,* and *cannot be taught.*

THE FACTS

Intelligence is *not* fixed.

It is a combination of hereditary factors, environmental factors (such as years of formal schooling), and thinking skills (such as problem-solving and abstract thinking).[1] So, intelligence can be taught—but only to a limited extent. The inheritability of IQ changes linearly over a person's lifespan, from 20 percent in early childhood, to 50 percent in adolescence, to 60 percent in adulthood.[2] The remaining percentages are non-inherited impacts on intelligence like environment, nutrition, and other life experiences such as traumatic events and school. For example: additional years of formal schooling lead to an increase in IQ scores—a phenomenon known as the Flynn Effect. Factors such as improved nutrition and education, as well as changing thinking styles due to our increasingly faster-paced lives and the adoption of new technologies have driven an increase in intelligence test performance over the last several decades.

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Creative Problem Solving in the Age of AI

by **Yangzi Zhao, Julia Higdon,** *and* **Işıl Çelimli**

The world woke up to a new reality on November 30, 2022: ChatGPT, an artificial intelligence (AI) tool, was publicly released. With its capacity to process natural language and generate practical results, ChatGPT wowed everyone. The breakthrough also triggered a fervent debate on how to leverage the tool's power and worries over potentially negative societal impacts.[1] Among educators and parents, concerns have centered around its effect on learning—in particular, that students might use AI to take shortcuts in their work, potentially learning less in the process (given AI's ability to excel in tasks including, but not limited to, coding, writing, and producing art, this concern is not unfounded).[2] The introduction of most new technologies, such as television and the internet, have been met with similar concerns. These concerns are rooted in a belief that students must labor in order to learn, and that shortcuts diminish learning. However, it is an advantage to students, not a drawback, that AI tools can do some of the labor involved in many tasks, potentially allowing students to focus their time and effort on honing creative problem-solving and thinking skills.

ChatGPT and the evolution of powerful AI tools can enable students to quickly move through some tasks, like generating code or writing the first draft of an essay, and potentially zero in on deeper learning and thinking practice. Understanding how to take advantage of AI's capacity to complement human intelligence will help students define and solve problems more effectively and creatively. Students will benefit most if they are equipped to understand and use AI effectively. Our interest is to harness the capacity of AI to cultivate students' ability to generate innovative ideas and become better problem-solvers.

Creative Problem-Solving Skills

Creative problem-solving is the process of using innovative or original ideas to define and find solutions for complex issues. Becoming a creative problem-solver requires originality, a quintessential human trait.[3] However, creative problem-solving is more than generating an original idea. It is the application of new ideas to tackle specific challenges and propose solutions.

> CREATIVE PROBLEM-SOLVING *lies at the* INTERSECTION *of* DIVERGENT *and* CONVERGENT THINKING.

Both divergent and convergent thinking are necessary to generate original and effective solutions. Divergent thinking allows humans to produce a wide array of solutions to a given problem, usually an open-ended task.[4] Divergent thinking is crucial, especially during the early stages of problem-solving, for several reasons. First, generating many ideas increases the likelihood of finding a promising solution. Second, divergent thinking promotes flexibility and risk-taking. Fixation on prior beliefs and avoiding uncertainties can hinder idea generation. In contrast, shifting perspectives and venturing into uncharted territories can reveal promising solutions. Divergent thinking also helps connect seemingly unrelated ideas, leading to innovative solutions. Finally, divergent thinking prevents us from rushing to conclusions prematurely. Suspending judgment allows a multitude of ideas to surface during divergent thinking.

While divergent thinking is critical during the idea generation phase, it is convergent thinking that transforms ideas into solutions.[5] Convergent thinking is how humans analyze, evaluate, and refine ideas and produce solutions and ways to implement them when dealing with complex problems. Convergent thinking requires analysis, critical thinking, rationality, and systematic approaches, and it demands that people evaluate the feasibility and applicability of ideas in a specific context. In a real-world setting, it is also important to consider the possible impact of each potential idea. For example, if this is an effective solution, is it also cost efficient? Could there be any risks involved? Are there ethical concerns? Is it necessary to adjust or refine the solution? Only after addressing such questions can a problem-solver devise and execute a solution.[6] Creative problem-solving lies at the intersection of divergent and convergent thinking. It functions best when people think broadly, capturing new and untested ideas to craft a thoughtful and specific solution.

Machine Thinking and Learning

AI is the human project of creating machines that can reason and learn. While this field is developing rapidly, at the time of this writing, students

have access to AI tools that use Artificial Narrow Intelligence (ANI), which specializes in solving specific problems and fulfilling particular tasks.[7] In this sense, narrow doesn't mean simple. Rather, it refers to defined tasks assigned by intelligent humans, such as having empathic conversations.[8] In fact, AI has accomplished highly complex tasks, most famously besting Garry Kasparov in chess in 1996.

Because of its large training datasets, algorithmic randomness, and search capacity, AI excels in generating many diverse ideas with great speed. Machines can hold more information, sift through information faster, and try all possible permutations relentlessly thanks to their computational power. Moreover, unlike humans, machines are infinitely patient during the sifting process and, because it lacks judgment, AI does not overthink. It does not pause to assess the relevance, appropriateness, or even the applicability of an idea when exploring unfamiliar domains.

In fact, some of the negative assessments of AI, such as "lack of intention," "randomness," and "no judgment," refer to the very traits that make AI a natural at simulating divergent thinking. For example, chemical engineers use machine learning models to search for the ideal chemical substances for intended chemical reactions, an otherwise time-consuming effort due to the trial-and-error nature of the process.[9] Human thinking is naturally prone to bias and other errors in thinking. While AI tools are also prone to bias and error, they can nevertheless shed light on ideas that may not have been considered during the divergent thinking process without this assistance. AI can be instrumental in helping organizations rethink their innovation process by removing constraints in information processing[10] and generating business ideas.[11]

Hybrid Intelligence

AI can enhance human cognitive capabilities for effective problem-solving. This process, also known as hybrid intelligence,[12] can empower humans. Using the tools currently available, humans guide AI by identifying a problem to solve and providing input, and students need to learn how to be good guides. To do so, they must develop the skills of planning, abstraction, evaluation, and critical thinking.

Humans identify a task to carry out and formulate a related request that AI can handle and execute. Students need to know what they are trying to accomplish, have the ability to translate their aim into input, and reflect on the quality of their own input. Working with AI tools requires students to evaluate and provide feedback across multiple machine-generated iterations, so they must discern whether or not each iteration represents progress toward their goal. For example, using AI to generate a particular image with certain qualities requires

students to both provide the specs of the task and evaluate the output by selecting the best among the AI-generated options and rejecting options that are farther from the goal.

Not all AI-generated ideas are accurate or relevant, so students need to develop the ability to assess what AI produces. In complex problem-solving tasks, students need to rely on prior knowledge and critical thinking skills to assess these outputs.[13] Empathy and perspective-taking are also elements in crafting solutions to problems because these skills provide contextual information regarding the emergence and impact of the problem. To ensure that a solution is applicable, useful, and relevant, a good understanding of diverse perspectives on the problem is helpful, and would enable students to generate thoughtful solutions.[14] Because machines are using data to process the student requests, if the data are biased, so are the products AI produces. Thus, students must also recognize bias in the output and improve their inputs to correct for this bias.[15]

In navigating the evolving landscape of machine-generated ideas, thinking skills become even more crucial for judging the quality and applicability of concepts. The ability to question assumptions, identify biases, and evaluate logical coherence at each iterative stage is essential. Critical thinking and an analytical mindset open the door to understanding the algorithms and data structures shaping AI outputs through various iterations, facilitating the recognition of patterns, anomalies, and potential areas for improvement. These thinking skills enable the assessment of the relevance, impact, and ethical considerations of AI-generated ideas and solutions, and will be important to students as they learn to use AI tools.

While it is true that AI reduces some laborious tasks, the much more fruitful labor of thinking is required of students using AI tools. This is the crux of the learning opportunity that AI tools provide and where we see the most value in using it in schools. We acknowledge the complex challenges this new technology brings about. In addition to thinking about how best to put AI in the service of learning, educators need to constantly consider how to mitigate its potential risks, especially the exacerbation of inequalities caused by some students not having access to AI tools. The balance between embracing technological breakthroughs and exercising human judgment is possible through developing an optimistic and critical approach to emerging technologies in a concerted effort to instill wisdom in students. Ed

LEVERAGING AI

The challenge is to find ways to leverage AI to make our students smarter and empower them to become better at solving problems. Here are some ideas.

INTEGRATE WITH CURRICULA

Integrate AI into school curricula to improve students' understanding and use of the tools. Students who have prior knowledge of AI or who received training on how to use AI are more likely to integrate AI in a productive way.[16] For example, consider developing a writing course that uses AI-generated text as a starting point for the editing process. Guiding students to use AI effectively and critically will be empowering.

FOCUS ON CREATIVE PROBLEM-SOLVING

Focus on using AI with students for creative problem-solving. While AI can relieve some of the labor of particular tasks, it is most helpful as an ally in solving problems. Particularly helpful would be curricula targeted at developing relevant and useful skills, such as problem identification, creating proper input, evaluating output, recognizing progress toward clear goals, and mitigating bias, among others, when using Al. Part of the reason AI is a good divergent thinker is that it is immune to risk aversion and the discomfort of deviating from routine. What makes humans' thinking indispensable is the ability to identify the correct problem, set up the specs of the problem, and synthesize and evaluate output. Projects that allow students to approach complex problems with the assistance of AI can help students develop valuable creative problem-solving skills.[17]

PRACTICE, PRACTICE, PRACTICE

As with any skill, learning how to use AI effectively and creatively to solve problems requires practice. Students need ample opportunities to use AI tools in order to refine their skills. Resist the temptation to curtail student usage and focus instead on tailored support for students as they learn to use these tools in different ways and over an extended period of time.

USE AI AND AUTHENTIC ASSESSMENT

Use AI and authentic assessment methods to provide student feedback. AI can offer new opportunities to assess learning as an alternative to traditional assessment methods which can be time consuming, rigid, and out of context.[18] With the help of AI, educators can devise new methods of providing feedback.[19] AI can provide answers to many student questions, in real time, freeing teachers to focus on learning. An immersive environment, which can even be in a game format,[20] can provide students with an open-ended problem to solve, while students need to adjust their strategies in an interactive feedback loop.[21] Preserving the student inputs, AI outputs, and work products can provide evidence of students' growth in their use of the tool and creative problem-solving abilities.

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“It is **not** that I’m so smart.
But I **stay** with the questions
much **longer**.”
Albert Einstein

MISTAKEN BELIEF

High intelligence *leads to* better school performance *and* job success.

THE FACTS

It's complicated.

Intelligence plays a moderate role in predicting academic performance and job success. However, there are other factors—such as divergent thinking, socioemotional skills, and even parents' level of education—that contribute to success in school, work, and personal life. Even if intelligence was fixed (which it is not), there are tons of other ways for a person to be smart and to become smarter.

IQ only correlates with success in some jobs. For example, intelligence is more highly correlated with success in hard sciences like physics than in fields like creative writing.[1] Further, correlation is not causation. IQ is correlated with school success in part because both emphasize the same skills. Traditionally, school has been designed to emphasize independent work on analytic tasks. We measure IQ through independent performance on analytic work. So, when we take a step back and think about it, is it really all that surprising that IQ and school success are correlated?

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On Making Kids Smarter

AN INTERVIEW WITH TONY WAGNER

BY IŞIL ÇELIMLI

Tony Wagner's career in education spans decades as a teacher, principal, and professor. His acclaimed book *Creating Innovators: The Making of Young People Who Will Change the World*, was a national bestseller, described by author Daniel Pink as "... important reading for anyone concerned about the future." In his new, much-anticipated memoir, *Learning by Heart* (excerpted in this issue), he recounts the failures and successes that provided key experiences throughout his growth as a learner and teacher. We were fortunate to have the opportunity to sit down with him and hear his perspective on what educators, parents, and policymakers can do to make kids smarter. His insights into redefining intelligence and equipping students with skills beyond conventional academic knowledge offer a valuable perspective on this issue's theme.

This interview was edited for clarity and length.

IC *Your memoir provides a wonderful context to your body of work. We enjoyed reading about your trajectory and understanding how you got to where you are today and how your experiences shaped your perspective and your educational philosophy. Based on your experiences as an educator, how would you describe a smart kid? What qualities or characteristics do you think make a kid smart?*

TW My immediate response is to be uncomfortable with the word "smart." One dictionary definition of smart is "sarcastic and quick." It is not a word that I cozy up to. But I understand that it is a big concern for parents.

I would suggest there are different kinds of intelligence. There's emotional intelligence. There is being quick-witted, another term I have difficulty with. If we're going to use the word smart, we need to redefine it. Curiosity is a hallmark of a deeply intelligent person. But intelligence is not inert and innate. Intelligence can be developed. We are all born curious, creative, and imaginative—that's the human DNA.

The average four-year-old asks 100 questions a day. But then something happens; we call it school. The longer kids are in school, the less curious and less imaginative they become. They become more preoccupied with getting the right answers as opposed to having the right questions.… There's also the emotional side of being smart: being aware of oneself and others. We don't normally associate the word empathy with smart, but I would.

Jean Piaget said the aim of education is to overcome egocentrism. Intellectually, that means replacing superstition with reason. Emotionally, overcoming egocentrism means developing the capacity for reciprocity, for empathy. A smart person is someone who has overcome their egocentrism. A smart person is curious, has learned to reason, to weigh evidence, understands herself, and is empathetic to others.

IC *What we're trying to do in this issue is broaden the definition of intelligence. And your answer captures a broader definition well. In light of that, do you think schools have made making kids smarter their mission in the past? Are they doing it now? Should they be doing that?*

TW Redefining being smart as being curious and emotionally aware and seeking to reason and weigh evidence? No, I don't think schools are developing intelligence. To the contrary, the first requirement of schooling is to sort kids according to artificial and contrived categories of test scores. Secondly, the aim of schools is to increase test scores, to increase eligibility for elite colleges. I don't think that has anything to do with developing smarts, except for becoming test-smart.

The tragedy of American education is we're making kids dumber, not smarter. We don't pay attention to their questions. We don't cultivate their capacity to ask good questions and to seek answers. We don't teach kids to think critically, to

weigh evidence, to understand different perspectives. That's why so often, you see the valedictorians of many schools ending up in mediocrity. They may have gotten the best grades, but they lack other kinds of intelligence: tenacity, the ability to empathize, to stay curious. Very often, it's the outlier kids, who get C's and B's, who end up making the greatest contributions.… because they have decided they want to pursue a range of interests that may or may not produce high grades or high test scores. They are more intrinsically motivated. I think the tragedy with smart kids is that they're primarily extrinsically motivated; they want to appear smart.

IC *How do you think schools should make kids smarter? Or should their ultimate mission be something different?*

TW I think schools should teach kids that intelligence is not fixed. The idea behind Carol Dweck's growth mindset is developing your intelligences—plural—requires grit, tenacity, perseverance, self-regulation, and self-discipline. Do I think schools can and should teach those qualities? Absolutely! In fact, if they're not teaching them, the fact that intelligence isn't fixed, that you can grow it, that curiosity is a muscle that needs to be strengthened, and that discipline, perseverance, and tenacity are critical elements to developing one's intelligence—if schools aren't teaching these, then what are schools for?

IC *If schools are not teaching kids these skills, what do you think the biggest obstacles are?*

> **"We are all born CURIOUS, CREATIVE, AND IMAGINATIVE— that's the human DNA."**

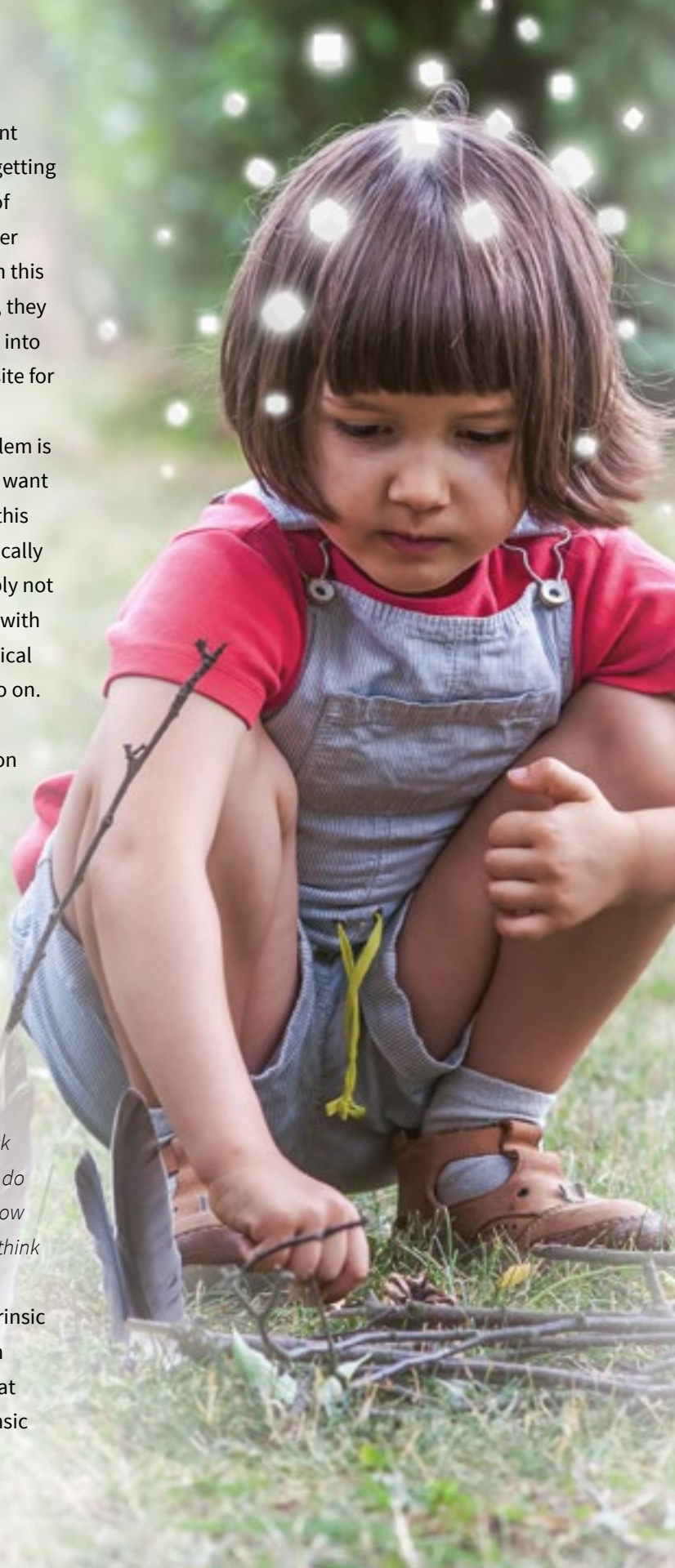
TW The biggest obstacle for independent schools is the mistaken belief that getting into an elite college is the real aim of education. That's definitely no longer true. Look at the majority of CEOs in this country: they went to state schools, they didn't go to elite universities. Going into an elite university is not a prerequisite for adult success or well-being.…

Now, for other schools the problem is poverty, pure and simple. We don't want to talk about childhood poverty in this country. We expect schools to magically overcome the deficits. And it's simply not possible—or it is possible, but only with services, wraparound schools, medical benefits, affordable housing, and so on.

The third impediment is simply habit. We've had the same education system for a century. It's all anybody knows. And that's teachers teaching the way they've been taught, parents want[ing] schools to look like the ones they'd gone to—or wish they had gone to.

IC *In the excerpt we include in this issue, you talk about the concept of "disciplined play," in addition to passion and purpose. Can you unpack these concepts a little bit more? What do you mean by passion and purpose? How do you define them? And how do you think they make kids smarter?*

TW Passion and purpose are part of intrinsic motivation, which is crucial from an educational viewpoint. Much of what we do in education reinforces extrinsic



motivation. It's pursuing extrinsic goals and validations. Passion and purpose, by contrast, like play, are intrinsic motivations. They come from within.

Passion is the intense pursuit of a deep interest, and it could be anything. Purpose implies something larger, wanting to make a contribution to some larger effort, to make a difference.… The innovators are driven by this intrinsic sense of wanting to make a difference, to make a larger contribution.

> **"… DISCIPLINED PLAY… is the mother of invention."**

Now disciplined play: too often, we think of play in only one dimension, "Oh, it's what kids do," and then you grow out of it. Or to be playful is to be silly. But play is behind many significant contributions in any field: art, science, humanities…. Johan Hoizinga, a Dutch historian, documented all the ways in which disciplined play had been behind many innovations. The common misbelief is, "Necessity is the mother of invention." Hoizinga would argue, "No, disciplined play, in fact, is the mother of invention." His book, called Homo Ludens, is a classic that translates into "Man, the Player."

IC *But, in addition to passion and purpose, there are some other skills, right? You talk about them extensively in your other work as well, especially when you write about how schools are stuck in a changing world, the importance of thinking skills, such as critical thinking, problem-solving, multiple perspectives, creativity…. How do you think these skills play into preparing kids for the world today, and in addition to play, passion, and purpose?*

TW These skills are foundational. Academic content knowledge is important, let's get clear, but it is on every internet-connected device.… Because knowledge is not fixed and is instantly available, the world simply doesn't care how much our kids know. What the world cares about is what they can do with what they know. Skills matter more than what you know, and motivation matters most.… The fundamental problem in education is we pay far too much attention to the teaching and testing of academic content knowledge, very often at the expense of skills.

Math is one of my favorite pet peeves. We're teaching kids at the high school level to do various calculations by hand that nobody does, not even engineers. And we are missing statistics, probability, computation, estimation, even basic math and financial literacy. These are skills that people need, as opposed to calculus and trigonometry, which are ancient bodies of content knowledge that kids will never, ever need or use in their lives, unless they go on to a career in mathematics. In school, math teaches kids that there are right answers and that you have to work through lots of problems. Speak to anyone who's a career mathematician—they'll tell you there are no right answers, and they may spend an entire career working on

one problem. We're not preparing kids for anything with our math curriculum.

And so is the case for high school science. How many students really understand the scientific method to the point where they could develop a hypothesis, design an experiment to test that hypothesis, and then present the results for review? Knowledge applied is knowledge deeply acquired. It is the application of knowledge that really develops the skills that matter most.

IC *What I'm hearing is schools should focus on applied knowledge and how to apply these skills. Based on this idea that schools should be doing much more than relaying academic content knowledge, how do you envision a redesign of schools?*

TW Today, a high school diploma and a college diploma are certificates of attendance. Because 100 years ago, the Carnegie Foundation—trying to make order out of the chaos of high schools and colleges—declared that a credit in high school represents 200 hours of seat time served in a classroom, and that you need somewhere between fourteen and seventeen to get a high school diploma.…

It is as if we said, "All right, we're going to teach you how to drive. But we're not going to actually test your driving skill. We're going to have you study the history of driving. We're going to have you memorize the parts of a car and take tests on those things. But driving itself, no, we don't really have time for that. And that's messy. And that's subjective. Whether you drive well or not, we really can't get

into that.” Now, obviously, being facetious here—but in a way, it tells the story. Our education system is based on seat time, not on proficiency, or competence, or mastery. What I want to see is a high school diploma being a certificate of mastery, or a certificate of initial mastery.…

Use scouting as an example. What do you do to get a camping badge? You don’t take a multiple-choice test on the parts of a tent. You don’t study the history of camping and take a test on it. It’s a performance-based assessment. You need some content knowledge, such as the fundamentals of navigation or first aid. But fundamentally, you’re assessed on your ability to plan and lead a multi-day trip. You’ve got to figure out the menus, the routes, the equipment. You’ve got to lead the whole day. Then, when you come back, you have to do a conservation project in your community. Only then do you get a so-called merit badge.

What I envision is a high school diploma being a collection of merit badges—a badge for the scientific method; a badge in historical thinking, where students would study a particular period in history looking at primary sources and then discuss and debate various implications; a badge of communication skills, competence and proficiency in multiple forms of communication with an effective research paper and effective speech. Then, there will be elective badges, maybe service learning or internships. Increasingly that’s what higher education does and will become, which is what more

and more post-secondary institutions are moving towards.

IC *Coming back to your memoir,* Learning by Heart, *can you talk about why you picked that title?*

TW We assume so often that the only learning worth documenting is deductive learning, is intellectual, is cerebral. Whereas for me—and for many people I know—the most important learning is more emotional and intuitive. You don't learn empathy by memorizing the definition. You can learn it from great literature. So much of learning that is truly important has an emotional component, an intuitive element. And we in the West, since the beginning of the Enlightenment, have tended to only prize and favor highly rationalized intelligence.

> **"You don't learn empathy by memorizing the definition. You can learn it from GREAT LITERATURE."**

IC *In your memoir, you write that "a predominantly abstract academic curriculum does not prepare the majority of students for meaningful work, lifelong learning, or active and engaged citizenship, nor does it help students to stay curious about the world or discover their deepest interests." What do you think is holding us back from creating programs that enable students to achieve these goals?*

TW First and foremost, we have to redefine the goal of education.… The aim of education

should be threefold: 1) to prepare students for meaningful, productive work, and that means skills; 2) to prepare students for civic life, and civic engagement, for citizenship—that's dispositions of character; and 3) to prepare kids for personal health and growth.… We need to take these three goals very seriously and develop the appropriate assessments for these skills and dispositions.… We waste far too much time on basic knowledge and [spend] far too little time teaching the skills that matter most.

IC *When I was teaching, I remember feeling completely overburdened and overwhelmed and not having enough time to do all the things that I needed to do. I always felt behind in every way. Do you have any thoughts about how to make the time or the space to incorporate those three pillars that you're talking about, in addition to the content knowledge into a classroom or school setting?*

TW I think one challenge is to pare down the content knowledge to what is most essential and enduring. So often, we are teaching kids and testing kids on things they forget the minute the test is over. Teach only what you want kids to remember a year from now! I'm only going to teach you the things you absolutely have to learn, that are foundational. Parts of speech? Not one of them. Calculus, trigonometry? Not one of them. Probability, computation, estimation? Absolutely! That would screen out what I would guess to be eighty-five percent of the curriculum being taught today.

Secondly, the challenge is to develop a radically different assessment system where we're looking at evidence of proficiency over time and creating a grading system that is consistent with that.… [Students] can do projects; they can do internships; they can create portfolios. Students can demonstrate competency or proficiency in many different ways.

And I think A should be reserved for genuine human excellence, which is not common. That's actually a better kind of preparation for adult life. Do you want to fly with a C-minus airline pilot? Do you know someone who's gotten fairly good at the take-off thing, but not so sure about that landing part? No, you expect a minimum standard of competence. And that's what we should be doing in school: defining what genuine proficiency looks like, what evidence would give us some

confidence in the student developing these proficiencies, and [then] backward mapping that from high school diploma, the end of middle school, to the end of elementary school.

IC *How do you think teachers should be trained to teach a curriculum based on these foundational competencies?*

TW Teachers cannot do this alone. There is not a single problem you can understand—let alone solve—using one academic discipline. The world is multidisciplinary; innovation is multidisciplinary; problem identification is multidisciplinary. Yet school is not. The challenge is to create opportunities for teams of teachers to work together across academic disciplines, to define the essential knowledge and skills, and to develop new forms of assessment.… Real innovation demands collaboration. And we don't give teachers anywhere near enough time to work collaboratively in most schools.

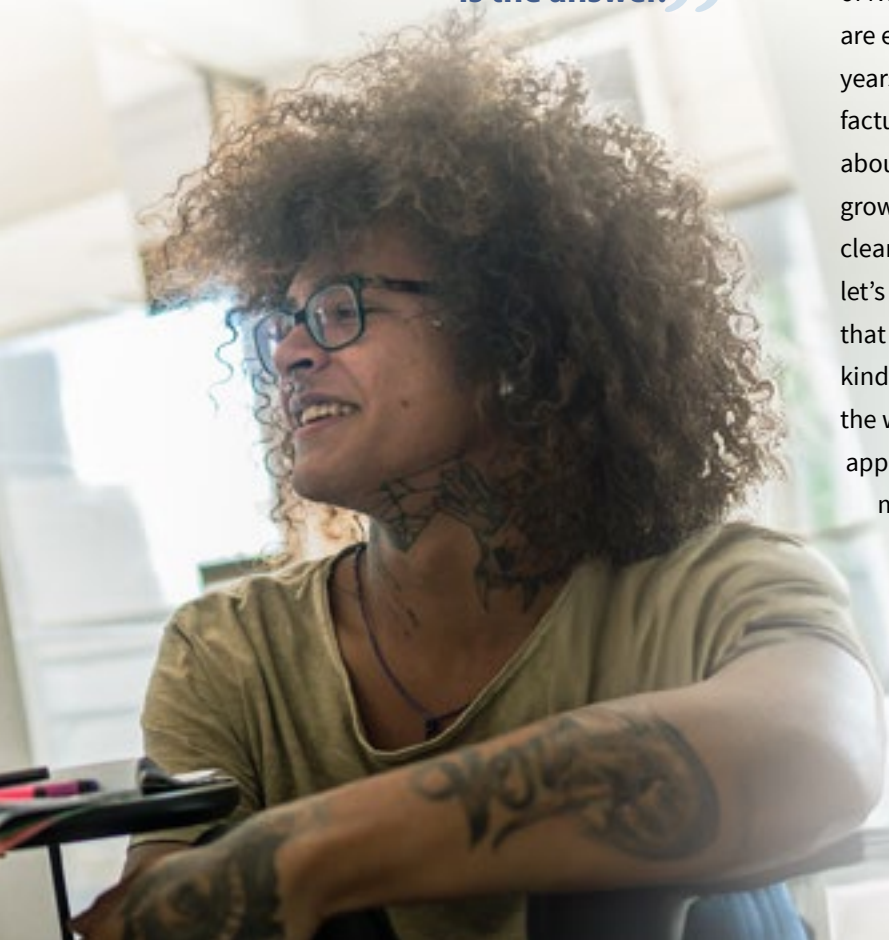
IC *Can you talk about the book on mastery that you're working on right now? How does that fit into your broader vision of the future of learning and education?*

TW It's very consistent with the idea that a high school diploma should be a certificate of mastery. First, we define what we mean by mastery and show examples from schools, workplaces, and one's personal life, where the pursuit of mastery has been successful. Included in that is the idea of self-mastery—the idea that to develop one's intelligence requires self-discipline, self-restraint, self-regulation, persistence, tenacity, all those things Angela Duckworth describes as part of grit.… So in a sense, there's mastery that's outward-facing, whether it's work or citizenship. And then there's self-mastery to lead a productive and fulfilling life.… It's being published by Basic Books and will be out in about a year. I have two co-authors, Ulrik Christensen, an expert on workplace learning, and Sujata Bhatt, who spends a great deal of her time in some of the cutting edge schools in this country.

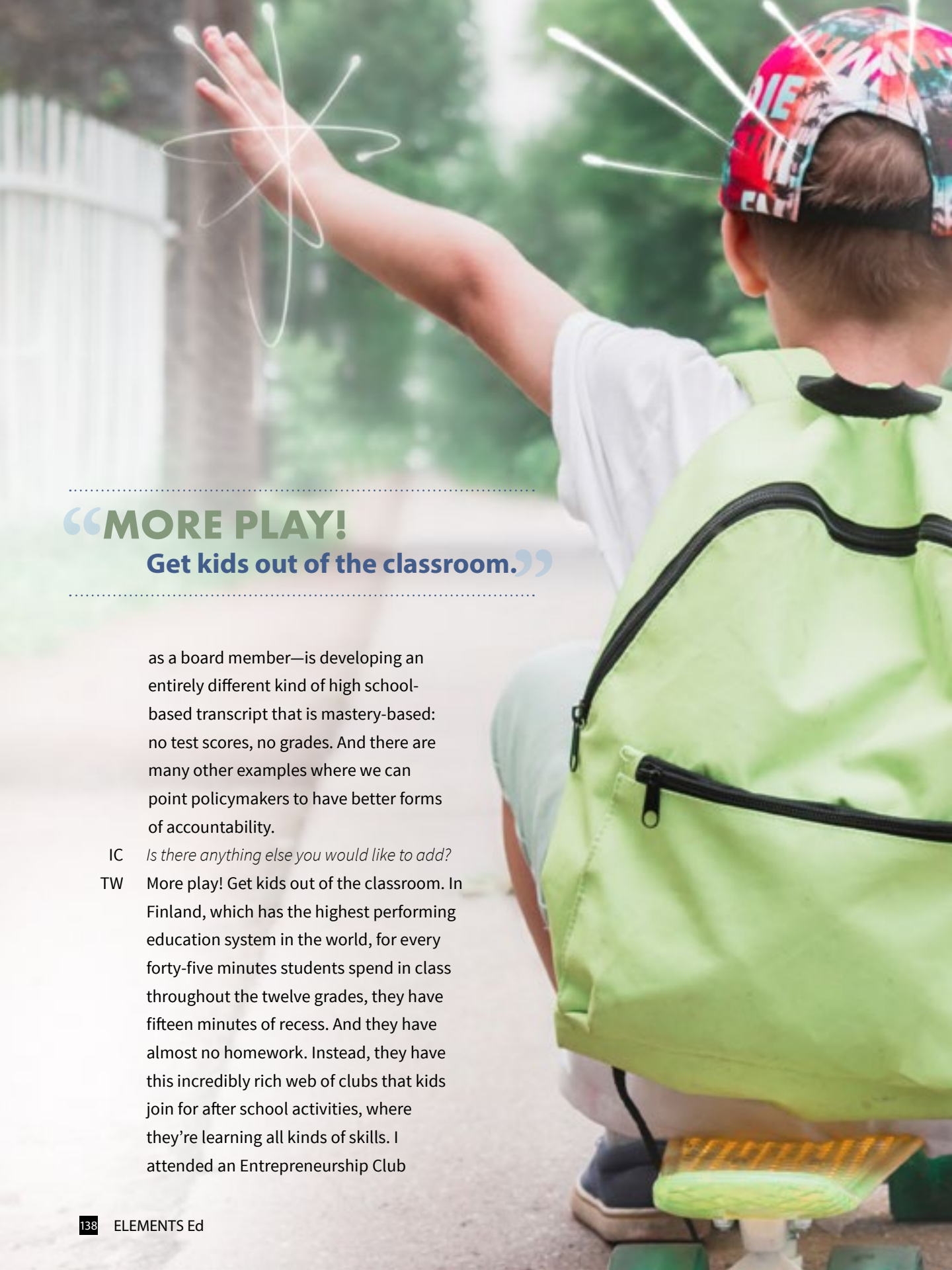
IC *Much of the conversation that we had so far pertains to schools and educators. What would you say are some things that parents can do differently to make their kids smarter? How about policymakers?*

TW For parents, cultivating curiosity is the answer. We are born curious, creative, and imaginative. Pay attention to kids' questions, nurture them, take them seriously. Make the dinnertime conversations around your questions and concerns about the world. Don't ask, "What did you do at school today?" Ask, "What made you more curious today?" or "What did you learn that concerned you or interested you today?" Make time for kids to pursue an interest.… It is critically important for parents to not think school performance is the be-all-and-end-all of a kid's life. That means encourage and nurture outside interests.… Passions derive from interests, and interests derive from being curious and asking questions. It is a developmental spiral and…you can't latch on to the end result. [You can't just say], "Oh, well, let's have passionate kids" without understanding [that], in fact, that evolves through the pursuit of curiosity, which becomes the pursuit of interests, which might develop into a passion.

"For parents, CULTIVATING CURIOSITY is the answer."



For policymakers, there is an absolutely critical mandate. Get rid of these tests, which tell us nothing about a student's capabilities and even less about a school's capabilities. In twenty-five years of No Child Left Behind testing, our kids are exactly where they were twenty-five years ago. We're teaching to low-level, factual recall tests that tell us nothing about work, citizenship, or personal growth and health readiness. Now let's be clear, I believe in accountability.… [But] let's create better forms of accountability that are reciprocal and relational, better kinds of assessments—which do exist, by the way. PISA, an excellent example, tests application of knowledge, a wonderful model, internationally. Locally, we have the Collegiate Learning Assessment and the College and Work Readiness Assessment sponsored by the Council of Education in New York…. The Mastery Transcript Consortium—[on] which I serve



"MORE PLAY!
Get kids out of the classroom."

as a board member—is developing an entirely different kind of high school-based transcript that is mastery-based: no test scores, no grades. And there are many other examples where we can point policymakers to have better forms of accountability.

IC *Is there anything else you would like to add?*

TW More play! Get kids out of the classroom. In Finland, which has the highest performing education system in the world, for every forty-five minutes students spend in class throughout the twelve grades, they have fifteen minutes of recess. And they have almost no homework. Instead, they have this incredibly rich web of clubs that kids join for after school activities, where they're learning all kinds of skills. I attended an Entrepreneurship Club

overnight meeting where kids were given a design problem … and they had twelve hours overnight to come up with an answer. They were up all night. It was a wonderful experience to watch. We need to understand that disciplined play is foundational to the human experience, to human aspiration as well as to human accomplishment. So if we're not teaching disciplined play, then what are we teaching? Ed

Tony Wagner is a Senior Research Fellow at the Learning Policy Institute. Previously, he was founder and co-director of the Change Leadership Group at the Harvard University Graduate School of Education and Expert in Residence at the Harvard I-Lab. Tony is the author of seven books, including two bestsellers *The Global Achievement Gap* and *Creating Innovators*. His website is tonywagner.com.

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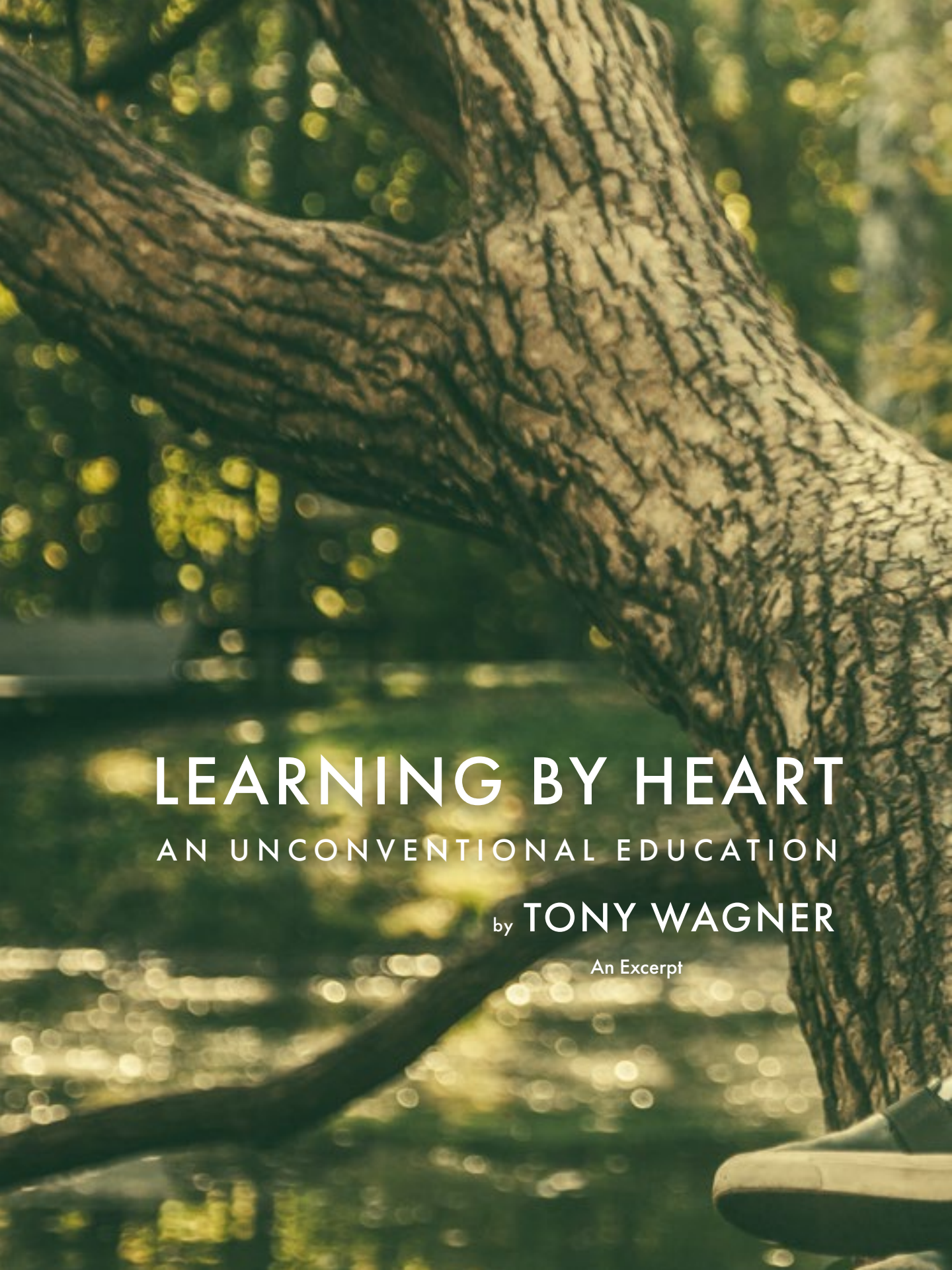


LEARNING BY HEART

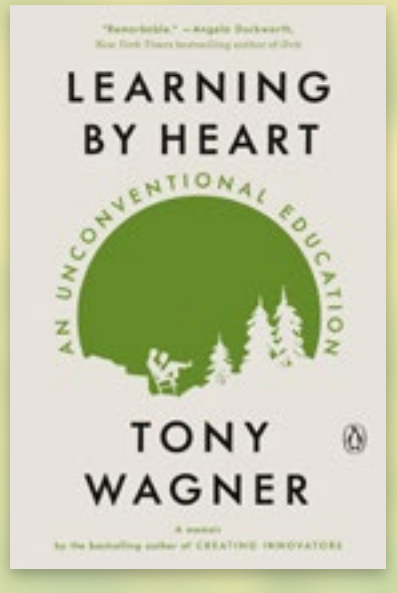
AN UNCONVENTIONAL EDUCATION

by TONY WAGNER

An Excerpt

Before Tony Wagner found success as an eminent educator, he was kicked out of middle school, expelled from high school, and dropped out of two colleges. In *Learning by Heart*, Wagner recounts his journey and writes about the successes and failures that provided key experiences throughout his growth as a learner and teacher. In the following excerpt, he writes about the crucial role of disciplined play, along with passion and purpose, in cultivating the love of learning and mastery.

It was a bright and breezy summer day when I drove over to the camp—the kind of day that was always so thrilling to wake up to when I had been a camper. Nick greeted me warmly as I came into the dining hall, and we sat down to lunch with forty or so counselors and staff who were seated at the same picnic tables and benches where I had wolfed down so many meals. The hall, with its low wood-plank ceiling, waist-high pine siding, and screen windows all around, was unchanged. What had changed, however, was that there are now women counselors. I hoped they had something of a taming and humanizing influence on the excess of testosterone that pervaded the all-male camp when I was there.



Nick looked the part of the outdoorsman that he is, with his neatly trimmed chestnut beard and a wiry athletic build. He said he had been involved in summer camps all his life—as a camper, counselor, and, for the past five years, executive director of Mowglis, whose enrollment had doubled under his leadership.

After lunch, I asked if I could have some time to walk down to the chapel. I wondered if it really was the mystical place that I remembered. But this time I wouldn't be there alone, as I had on so many other occasions. Nick and Jim Hart, the director of alumni relations and unofficial camp historian, wanted to accompany me and know more about my camp memories. Passing Grey Brothers Hall and the sleeping cabins, I could almost see a younger me racing down the path in front of us, eager to leap into the lake.

As ever, the chapel arch stood silent sentry in the soft shadows of the midday sun. The empty pews beckoned me to sit in the stillness and listen and let go. But I couldn't linger, not today. I knew that both Nick and Jim were pressed for time.

Walking back up the hill, Jim asked, "Who were your buddies at camp?"

I smiled wryly. How could I explain? "I studied Native American lore with Mr. West for a summer, and his son, Jimmy, and I were friends the year he was here. But I remember Colonel Elwell most vividly," I answered.

"I can send you a link to the Colonel's dissertation, if you like," Jim offered.

Dissertation? I had no idea that he was anything other than the camp's former director and axemanship teacher—an old wise man with a gravelly voice and a warm smile.

In fact, Colonel Alcott Farrar Elwell was an education critic and a visionary—a kindred spirit. He was the son of Frank Edwin Elwell, a sculptor and museum curator, and Molina Mary Hildreth, born, with his twin brother, Bruce, in Cambridge, Massachusetts, in 1886. Alcott was named for his godmother, Louisa May Alcott. The family spent much of the boys' early years in Europe, but they returned to Cambridge in time for them to finish their middle and high school years in public schools there.

In 1905, two years after the camp's founding, Alcott Elwell was recruited by Mowglis's founder, Mrs. Elizabeth Ford Holt, to be an assistant counselor. He returned nearly every summer for

more than fifty years. He was named assistant director of Mowglis in 1914, and became the owner and director in 1925, a year before Mrs. Holt died.

He entered Harvard in 1906, but it took him eleven years to complete his undergraduate degree because he had to take a leave of absence a number of times in order to earn enough money to continue his studies. During these years, he worked as a cook on a geological expedition in Wyoming, as a nurse, and as an automobile mechanic, and he founded a school for boys. In 1917, he entered the army as an officer, trained recruits for the duration of the First World War, and then returned to the Harvard Graduate School of Education, where he completed his master's in 1921 and his doctorate in 1925.

> "... a predominantly abstract academic curriculum does not prepare the majority of students for meaningful work, lifelong learning, or active and engaged citizenship."

The title of his doctoral dissertation was "The Summer Camp—A New Factor in Education." Like Mrs. Holt, the Colonel was deeply concerned about the impact of growing industrialization and the loss of connection to rural life for children. "This is a time when cities are drawing population from the countryside and confining the individual socially, mentally, and physically to a mechanical existence… The disappearance of the farm in a measure has destroyed the opportunities for personal experience as a phase of education," he wrote. Elwell saw the growing movement to establish "schools of the open" as a logical extension of the New England transcendentalist movement of the nineteenth century: "What Emerson and Thoreau did for the grown-ups of a generation or two ago, the Boy Scouts, Girl Scouts, Camp Fire Girls and Woodcraft League are doing for the children today."

He didn't advocate a "return to nature" for aesthetic or spiritual reasons, however, and he was not interested in creating summer camps as places to entertain kids when school was out of session. Instead, Elwell was deeply concerned about what twentieth-century schooling was doing to children. He argued: "There is a tendency in education to teach the greater proportion of children an outlook of limitation—even of failure, rather than success. Visit some of the public schools and watch. Twenty per cent of the children are learning to be successful, and eighty per cent are learning to be limited—what they cannot do, not what they can do."

Even more fascinating to me, he placed the blame squarely on the demands of the emerging "college prep" high school curriculum and the lecture method of teaching that it encourages. "Schools are circumscribed by the college requirements," he wrote, "even to those who are not going to college at all." Elwell believed, as do I, that a predominantly abstract academic curriculum does not prepare the majority of students for meaningful work, lifelong learning, or active and engaged citizenship. Nor does it help students to stay curious about the world or discover their deepest interests.

The American high school course of studies was essentially created in 1894 by the so-called Committee of Ten, chaired by Harvard president Charles Eliot. These ten men declared that all incoming college freshmen should have completed lessons in specific subjects for a prescribed amount of time. Their unit of measurement for education came to be called the Carnegie Unit. A Carnegie Unit is the amount of "seat time served" in a given class—roughly 120 hours of a class over the course of a school year. The system remains unchanged today, as students have to earn between eighteen

and twenty-four Carnegie Units—the number varies state by state—in order to graduate from high school.

However, having the requisite number of Carnegie Units isn't enough to get kids into college. Students' grades in a class are supposed to represent how well they served their time, and students' grade point averages and class ranks are taken as measures of how well they have performed compared with their peers. These numbers still make up the typical high school transcript, which is required in order to be considered for admission by virtually every college and university in America.

In constructing this system, the Committee of Ten deified a kind of academic "scholarship" that allows only a comparatively few students to succeed. The typical bell curve grading system, which is necessary to allow for comparison between students, sorts the kids of a school into a few winners—the A students—and everybody else. Those who get a lower grade are often made to feel as though they are lacking—either lazy or less intelligent, sometimes both. Elwell was troubled by the impact of this scheme on adolescents. He believed that it was "a loss to society" that the "specialized requirements" of a college prep curriculum favored a minority of students, while creating feelings of "inferiority" among the majority.

But the Colonel wasn't merely troubled by changes in the education system. Like other social critics of the 1920s, he was deeply apprehensive about the dog-eat-dog competition and preoccupation with making money that characterized the era. He asked whether "a sense of cooperation can be brought to civilized man before the shadows grow too deep," and, he argued, "one need in life is a new point of view about individual success—from that of taking to that of giving."

Elwell declared that the antidote to increased competition and self-centeredness was play. As I learned from Jean Piaget when I first read *The Moral Judgment of the Child* in my twenties, when children play together, a spirit of "fair play" is developed, and they become less egocentric. Similarly, Elwell stated, "Human beings become more brotherly and thus become play-fellows . . . ever moving towards better cooperation… The time is fast approaching when there must be education for mature play—a landmark along the path of survival, man's first breathing space."

> One of the goals of education must be to encourage a kind of play in school—opportunities to try new things and pursue interests—so that young people can discover their passion and purpose.

In my own research on how best to develop young people's creative problem-solving capabilities and prepare them for the innovation era, I've explored the role of play, passion, and purpose. Pursuing a purpose—whether social, artistic, or scientific—is, I've realized, a form of disciplined adult play. One of the goals of education must be to encourage a kind of play in school—opportunities to try new things and pursue interests—so that young people can discover their passion and purpose. Without the development of these intrinsic motivations for learning, education is little more than memorization and serving seat time—useless to young people as they go out into today's world.

Around the time that Elwell was writing his dissertation, Sherwood Dodge Shankland was named the first executive secretary of the National Education Association's Department of School Superintendence, an office he would hold for

twenty-five years. (The organization changed its name to the American Association of School Administrators in 1937.) In a speech given at Columbia University, Shankland declared that there were "four requirements in the Aim of Education":

1. Knowledge for present need
2. Knowledge for adjustment to change learning by heart
3. Knowledge of the other fellow's point of view
4. Knowledge that wakes the soul

"Of these, at least three can be taught through the life at camp better than at school," Elwell noted.

At heart, Elwell was asking, *What is the purpose of education?* and *How best can we serve that purpose?* in light of the changes wrought by the industrial era. Much of my life's work has been an attempt to answer these same questions, but at the dawn of the innovation era, with its accelerating changes wrought by the advent of the internet and other technologies. The Colonel found a remarkable answer, one that resonates deeply with me today:

> Summer camps are helping break down the notion that education is mental discipline; that unless the thing is unpleasantly difficult and abstract, it is not education. It is not what we learn but what we utilize that makes up our ability, and camp is helping to create usable ability [my emphasis]... Summer camp, instead of supplementing education, is education—just exactly as the life of the child is not preparation for life at some future time but all there is of life at the present moment.

A growing number of educators are coming to understand that children's potential can be greatly expanded with effective coaching and opportunities to develop usable ability through classroom projects where they apply what they've learned. Carol Dweck, a professor of psychology at Stanford, describes the role of a "growth mindset"—the idea that we can all improve through effort, and that our capabilities are not fixed at birth. Angela Duckworth, a professor at the University of Pennsylvania, has shown that "grit"—the combination of perseverance, tenacity, self-discipline, and curiosity—is more important for success than the outdated measure of IQ. Taken together, these two ideas are reshaping classrooms around the world. Students can be taught that effort matters more than mere ability, and their grit "muscles" can be gradually strengthened when they are given assignments they see as worth doing. As they learn to work longer and harder toward goals that they

previously thought were unattainable, they feel their success, which bolsters their confidence and becomes self-reinforcing. The job of the teacher should be to develop this potential, rather than having to waste time preparing students for outdated tests and then judging each child's achievement relative to others.

Elwell recognized these truths a century ago. He explained that the purpose of his "school of the open" was to teach:

1. The expectation of success
2. The fearless outlook
3. Undiminished hope
4. The see-it-through desire

"These unfortunately are not in the academic curriculum," he added with evident sadness. "And yet, behind every page learning by heart of the academic curriculum, their presence or absence determines the issue."

In his concluding paragraph, the Colonel allowed himself to wax poetic: "The School of the Open is a school for simplicity and primitive reality, in which growth is in social ideals and cooperation coupled to better understanding of one's self. The child who can see simply and look into the heart of nature will have a key to the Book of Life—this is Education."

Looking back, my summers at Mowglis certainly taught me to "look into the heart of nature." Equally important, I now see that the camp's emphasis on earning ribbons as evidence of proficiency, along with the scouting movement's merit badge system, contributed significantly to my vision of a high school diploma for the twenty-first century. Rather than being a collection of Carnegie Units, I think a high school diploma should be a certificate of mastery—a collection of required and elective merit badges or ribbons that students earn by showing evidence of proficiency in essential skills and content areas.

> "... a high school diploma should be a certificate of mastery—a collection of required and elective merit badges or ribbons that students earn by showing **evidence of proficiency** in essential skills and content areas."

For example, instead of having to memorize the periodic table in chemistry, or definitions of terms like domain, kingdom, phylum, class, order, family, genus, and species in biology—information that changes, or can now be looked up on a smartphone—I think students should be asked to demonstrate proficiency in the use of the scientific method. All high school students, working alone or in teams, should be required to develop a hypothesis, design and conduct an experiment to test it, and analyze and present the results. And the only grade meted out would be a credit, once the student has shown this mastery.

In working to earn my much-prized orange ribbon, I never took a timed multiple-choice test on the history of axemanship or the parts of an axe. Points weren't taken off when my tree didn't fall as planned, and my work wasn't graded on a bell curve. There was no failure, only learning from trial and error. I simply kept working until I met the prescribed performance standard for the ribbon. I had to demonstrate "usable ability" as Colonel Elwell put it. What matters most is not what you know, but rather what you can do with what The Colonel didn't presume that he could change the nature of schooling. Instead, his strategy was to advocate for publicly funded summer camps to be set up outside of urban areas for all children. He thought such programs could supplement the months of required schooling indoors and "produce

savings of thousands of dollars in expenses of juvenile courts, officers, and houses of correction." And they might well have, but his camps were never established—not in a systematic way.

And just as the Colonel's vision could not transform education, neither could my Mowglis experience altogether compensate for my experiences at school. As a camper, I couldn't possibly realize that what I learned from Mr. West and the Colonel were vital life lessons. Camp wasn't school; I wasn't learning by heart taking tests or getting grades, so how could I be learning anything?

And yet I was. Mr. West kindled in me a deep appreciation for another culture that translated in later life to a hunger to travel and to study anthropology. Without words, he taught me that it was okay to be different and to identify with others who were different as well. He also exposed me to a completely new way of thinking about religion.

Working with the Colonel in the woodlot, I learned to persevere and take pride in achieving a goal that I had set for myself. I experienced what it meant to develop real skillfulness and mastery for the first time. Were there things he might have said to me then to nudge me toward a life's work that is so strikingly similar to his? It's a question that intrigues me.

Collectively, the lessons I learned at Mowglis did not outweigh the sense of being a failure and an outcast—the main lessons I was taught the other nine months of the year. Eight weeks in the summer weren't nearly enough. Nevertheless, the time I spent at Mowglis gave me a sense of possibilities—in myself and in learning—that I would not otherwise have known. Not until many years, and several colleges, later did I find a place where experiential and book learning came together, where knowledge was understood to come from both the head and the heart. Ed

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ELEMENTS *from the* FUTURE

by Jill Butler

POWERED BY META X2

Ray-Ban VISOR

MONARCH BUTTERFLY

Danaus plexippus

Also known as: milkweed, common tiger, wanderer, black-veined brown

FAST FACTS

TYPE: Invertebrate
DIET: Herbivore
GROUP NAME: Flutter
LIFE SPAN: 6 to 8 months
WINGSPAN: 3.7 to 4.1 in
WEIGHT: 0.0095 to 0.026 oz

Monarchs live in North America, Central America, South America, Australia, some Pacific Islands, India, and Western Europe.

A monarch's brightly-colored wings tell predators: "Don't eat me. I'm poisonous." Monarchs get their toxins from milkweed plants. During the caterpillar stage, monarchs only eat milkweed.

DID YOU KNOW?

Every year, when the weather starts getting colder, millions of monarch butterflies leave their homes in Canada and the United States and fly south until they reach Southern California or central Mexico. Some monarchs fly up to 3,000 miles on this annual one-way migration.

This is a female monarch. You can tell because she does not have black spots on her hindwings.

Hey Meta...tell me about this pretty insect


“We must all **reinvent** an education
that is **worthy** of our **children**.”
Roberta Michnick Golinkoff & Kathy Hirsh-Pasek

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