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Spotlight on Learning

The underlying idea behind this book is that learning is the imperative. In my view, putting student learning at the center of schooling, with a focus on providing high levels of learning for all is the major transformation in education over the past century. I do not mean to suggest that this goal has been met, but I do not apologize for believing that the "preferred future" is an era where the goal of schooling is to educate all children well, rather than selecting a "talented tenth" to be prepared for knowledge work (Darling-Hammond, 1994), a future where it is no longer sufficient for schools to sort their students and cull out the ones who don't fit the school's recipe for learning. Although the journey toward this goal is often disrupted and circuitous, I continue to believe that it is an essential goal that lies at the moral purpose of teachers' professional accountability.

Assumption: Learning is the imperative in schools.and across examples.

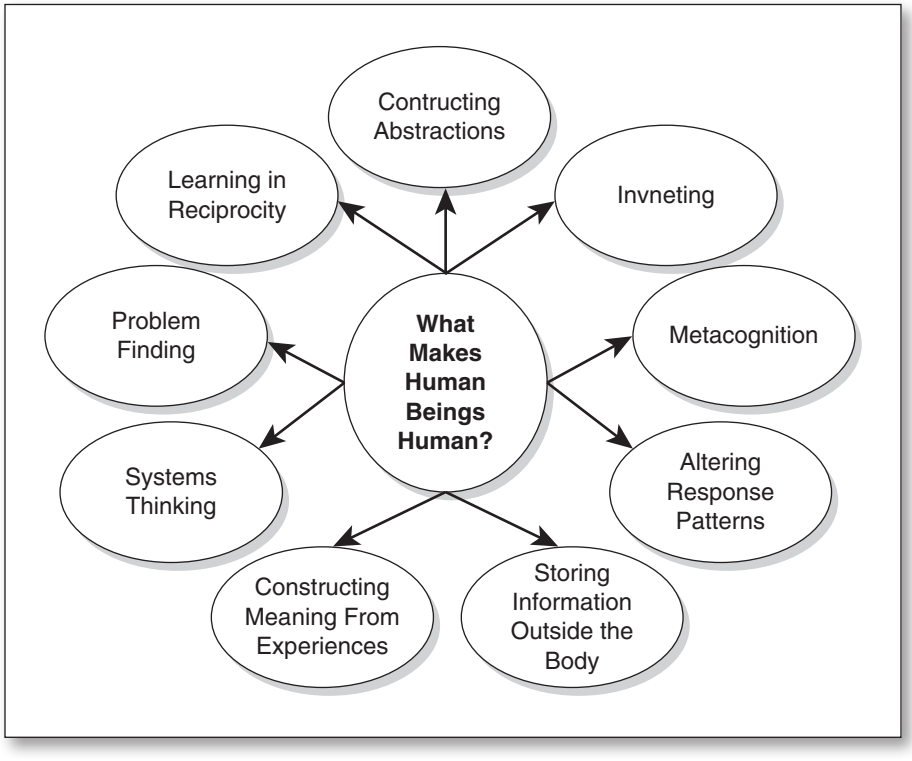
Learning Makes Us Human

Learning has always provided the advantage for human survival through difficult, even seemingly impossible times. Human beings are able to learn, unlearn, share their learning, and pass learning on to those who follow. Learning is at the core of our being, as individuals and collectively. It is the key to equipping future generations to

respond and to survive in a frenetically and unpredictably changing world. And perhaps most important, *we have not even approached the limits of what can be learned.*

Figure 4.1 shows the powerful and unique learning qualities that human beings have at their disposal for harnessing information and making sense of the world.

Figure 4.1 What Makes Humans Human?



Source: Stoll, Fink, & Earl (2002) (adapted from Costa, 1996)

These human qualities that Costa (1996) outlined are the foundation of our ability to learn.

- *Metacognition.* Human beings can reflect on their thinking processes. Experts describe their thinking as an internal conversation—monitoring their understanding, predicting their performance, deciding what else they need to know, organizing and reorganizing ideas, checking for consistency between different pieces of information, and drawing analogies that help them advance their understanding.

- *Inventing.* Human beings are creative and often motivated intrinsically, rather than extrinsically, to work on tasks because of the challenge. They constantly strive for greater fluency, elaboration, novelty, parsimony, simplicity, craftsmanship, perfection, harmony, beauty, and balance.

- *Constructing abstraction.* Humans have the capacity to use language, images, and numbers as symbols to transform events into categories and patterns. These symbolic systems make it possible for people to think in abstractions and to order and reorder the world in thought.

- *Reciprocal learning.* Human beings are social creatures with a compulsive craving to engage with one another. They learn best in groups, as they listen to one another, strive for agreement, and rethink their beliefs and understanding.

- *Problem finding.* Not only are humans able to search for problems to solve, but also they appear to enjoy it. Humans question and sense ambiguities and anomalies in the world around them. Once there is some doubt, they look for better ways of understanding the nature of things.

- *Systems thinking.* Humans are able to see patterns, congruencies, and inconsistencies while still focusing on the whole. This capacity allows them to consider many perspectives and to imagine how changing one element can have an impact on the total system.

- *Deriving meaning from experience.* One of the most significant attributes of human beings is that they can reflect on and learn from their experiences. They can stand back, monitor activities, and modify actions or beliefs.

- *Storing information outside the body.* Humans store, organize, and retrieve information in and from locations other than their bodies. From cave drawings, to books, to videodisks, external storage and retrieval systems provide access to information far beyond the limits of memory.

- *Altering response patterns.* Although a certain amount of human activity may be hardwired, people are able to make significant conscious and deliberate choices about their behavior. They are always capable of learning and altering their responses based on new ideas or understanding.

How People Learn

The Assessment and Teaching of 21st Century Skills (ATCS, 2012) at the University of Melbourne have categorized 21st-century skills internationally into four broad categories:

- *Ways of thinking.* Creativity, critical thinking, problem solving, decision making, and learning
- *Ways of working.* Communication and collaboration
- *Tools for working.* Information and communications technology (ICT) and information literacy
- *Skills for living in the world.* Citizenship, life and career, and personal and social responsibility

In the first edition, I highlighted the bold statement by David Perkins (1992), "We already know enough about how learning works, how teachers teach, and how to cope with diversity to do a much better job of education." Since that time, there have been many advances in the knowledge base related to human learning, some of them with the power to transform education. The challenge for educators is to apply the emerging understanding about learning to help students become the citizens for a preferred future—where all students, not just a few, will learn. They will learn not only the foundation skills of language and mathematics but a whole range of new basics, such as accessing, interpreting, and applying information; critical thinking and analysis; solving novel problems; making informed judgments; working independently and in groups; discerning appropriate course of action in ambiguous situations; and myriad other skills to equip them for life in the 21st century.

Learning is not a static trait. It is a dynamic process that can be learned and developed through the iterative process of fitting information into patterns or schema of similarities, differences, likeness, and regularities. *How People Learn: Brain, Mind, Experience and School,* the seminal synthesis of literature in the cognitive and developmental sciences produced by the National Research Council in the USA (Bransford, Brown, & Cocking, 2000), identified three principles that underpin how people learn:

1. Students come to the classroom with preconceptions about how the world works. If their understanding is not engaged,

they may fail to grasp the new concepts and information, or they may learn them for purposes of the test but revert to their preconceptions outside the classroom.

2. To develop competence in an area of inquiry, students must have a deep foundation of factual knowledge, understand facts and ideas in the context of a conceptual framework, and organize knowledge in ways that facilitate retrieval and application.

3. A metacognitive approach to instruction can help students learn to take control of their learning by defining learning goals and monitoring their progress in achieving them.

These principles portray learning as an interactive process by which learners try to make sense of new information and integrate it into what they already know. Learning is not a passive process. Young minds are not empty of ideas ready to receive our wisdom any more than adult minds are sponges absorbing new ideas from the air. From the earliest days, the minds of infants are active and toiling to make sense of the world around them. Over time, this sense-making activity is made up of conscious attention, organizing and reorganizing ideas, assimilating or accommodating to new ideas, and constantly reshuffling and reorganizing in efforts to connect ideas into coherent patterns. Learning begins with some level of *consciousness* when someone focuses attention on it or because something about it commands attention. Once something enters consciousness, the human mind goes to work to organize it and connect it to what it already knows. This involves processing the information, searching for and retrieving information from memory or experience, checking the match between the new information and prior knowledge, monitoring comprehension, reorganizing ideas, and coming to decisions about what the new information means and where it fits. All of this activity happens at lightning speed; generally, the learner is completely unaware of the process. Somehow, the wealth of information existing outside a person becomes part of an individual's internal knowing. They construct a mental map, an internal representation that allows them to retrieve information efficiently and use it by making connections to other ideas. As learning progresses, learners move beyond the basic rules associated with any field until it becomes automatic and they are comfortable in a domain and begin to build their understanding by acting, assessing what happens, reflecting, designing new strategies. and acting again. This is the "stuff" of classrooms and schools.

Before teachers can plan for targeted teaching and classroom activities, they need to have a sense of what it is that pupils are thinking.

What do they believe is true? This process involves much more than "Do they have the right or wrong answer?" It means making pupils' thinking visible and understanding the images and patterns that they have constructed to make sense of the world from their perspective (Earl, 2003). It means using this information to provide scaffolding for the learner to create new connections and attach these connections to a conceptual framework that allows efficient and effective retrieval and use of the new information. As John Hattie (2009) puts it in his extraordinary metaanalysis of correlates of achievement,

> It is not a particular method, or a particular script that makes the difference [for learning]; it is attending to personalizing the learning, getting greater precision about how students are progressing in their learning, and ensuring professional learning of the teachers and how and when to provide different or more effective strategies for teaching and learning. (p. 245)

The spotlight on learning has revealed a great deal more than the breadth and depth of learning for young people in schools. The changing nature of knowledge about learning has also brought issues of adult learning into the foreground, with teachers and leaders also facing mountains of new learning and having to construct and reconstruct their knowledge and beliefs. Perhaps the most powerful addition to this edition is the contribution of learning theory research to my understanding and reaffirmation of the importance of new learning at all levels of the education system.

Learning for Understanding

So if learning for understanding is the primary purpose of schools (a huge shift in beliefs), what is learning for understanding? Being able to recall and even to apply concepts doesn't necessarily mean that the ideas have been understood. Most students, including the best students in the best schools, don't really understand (Gardner, 1991). All too often, children learn how to plug numbers into a formula or memorize descriptions of complex phenomena, but when they encounter the concepts in a new situation, they do not know how to use them. Material is kept in memory and drawn out (often erroneously) when it might fit. Unfortunately, students often know far more than they understand about subjects they have studied and suffer from many misconceptions or misunderstandings (Perkins & Unger,

2000). Learning for understanding suggests a much deeper grasp of underlying ideas and concepts, not just recitation of algorithms or rules. Understanding is knowledge in action. Students who understand can take knowledge, concepts, skills, and facts and apply them in new situations where they are appropriate. Bransford et al., (2000) provide an example using Einstein's theory of relativity that should resonate for many of you. What would constitute evidence that someone understood $E=MC^2$? Reciting the equation only shows that it has been remembered; it does not show that it has been understood. Understanding involves knowledge about energy, mass, velocity of light, and mathematical notions such as "square." But this isn't enough. One would have to be able to use these concepts according to rules of physics, to support the theory with evidence, to identify the problems the theory solves and the theories it replaces, and so on. Deep understanding is having a grasp of the structure of a discipline, seeing how things are related, using the ideas in novel situations, and evaluating, even challenging, the knowledge claims embedded in the discipline.

> New insights don't happen by osmosis. They come from facing ideas that challenge the familiar ways of viewing issues.
>
> Earl and Katz (2006)

Prior knowledge of a topic or idea provides the foundation for linking new ideas and building complex mental models but as the Einstein example shows, knowledge in itself doesn't guarantee understanding. People need a rich base of knowledge about the subjects under consideration and a great deal of experience to become comfortable with the ideas and create the mental models that organize them.

Studies that examine differences between experts and novices have provided enormous insights into how knowledge and understanding work together (Bransford et al, 2000). Certainly, novices possess less knowledge than experts and less skill. But it is not merely the amount of knowledge or the number of skills that distinguish experts from their less successful peers. Experts also have well-honed regulatory systems that come into play when they become aware that something (facts or skills) is missing or doesn't fit. They display planfulness, control, and reflection in their actions. They are aware of the knowledge and skills that they possess, or are lacking, and use a range of strategies to actively implement them or acquire them (Ertmer & Newby, 1996). Novices may lack important knowledge or may have memorized a wealth of disconnected facts, without any organizing structure or concept to provide understanding or transfer to new situations. Because they do not yet have these organizers, they need rules to help

> The research . . . shows clearly that "usable knowledge" is not the same as a mere list of disconnected facts. Experts' knowledge is connected and organized around important concepts (e.g., Newton's second law of motion); it is "conditionalized" to specify the contexts in which it is applicable; it supports understanding and transfer (to other contexts) rather than only the ability to remember.
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> Bransford et al. (2000)

them see the order of things and develop knowledge and schemata for future reference. Over time, as they become more proficient, some parts of the process no longer require conscious attention; they become automatic. When this happens, they can start to move outside rigorous adherence to the rules and begin to adapt and to make the learning their own, reflecting a unique constellation of talents and ideas. When something doesn't appear to be working, however, even experts go back to the rules as a strategy for self-monitoring and correction. Imagine a professional tennis player executing a serve. When it's working, it's an ace. When it's not, even a professional goes back to the practice court and to first principles, often with a video camera as an aid.

Experts organize and classify their knowledge around important concepts and draw on these configurations of useable knowledge in their thinking because the ideas have become automatic parts of their thinking. With this kind of automaticity, experts can use the concepts in an unstructured world where there are very complex interactions of multiple factors. They use metacognition and reflection to control and perfect their learning. Perhaps most important, they take personal responsibility for the outcomes of their learning; they fine-tune their understanding by checking it against other information; and, they use self-monitoring to signal the need for a return to the rules or a search for new information.

As if it isn't complicated enough to think about making connections that stimulate deep understanding, it is also important to remember that each individual is unique. As with all other human characteristics, learning is diverse and different for each learner. It is a function of heredity, experiences, perspectives, backgrounds, talents, interests, capacities, needs, and the unpredictable flow of any particular life. Learners have different emotional states, rates, and styles of learning, stages of development, abilities, talents, feelings of efficacy, and other needs. It is exactly this diversity that provides innumerable opportunities for expanding learning—first, by acknowledging differences in physiological, personal, linguistic, cultural, and social backgrounds and second, by focusing on the common features that make all of us human. But the differences must be taken into

account as well, to provide all learners with the necessary challenges and opportunities for learning and self-development.

Learning Is Hard Work

When people are involved in new learning and the new information is largely consistent with prior ideas and beliefs, it is usually combined easily with existing knowledge and reinforces the existing views. If the new information is inconsistent or in conflict with existing ideas, the learner may be required to transform previous beliefs. When this happens, the learner experiences dissonance and disorder, and needs sustained attention and energy to keep going. This is not just a cognitive process; it is emotional because every piece of information gets evaluated for its bearing on the self and the potential effect on the learner's environment. Even though the dissonance causes discomfort, it is essential for conceptual change and, therefore, serious learning. Learning results from these episodes of dissonance (Linn & Songer, 1991; Olsen & Bruner, 1997).

Cognitive psychologists have written for decades about the two "A"s—two ways that people respond when they are confronted with new knowledge—assimilation and accommodation. Assimilation happens when new information is largely consistent with an individual's prior ideas and beliefs, combines easily with existing knowledge, and reinforces existing views. If new information conflicts with existing ideas, the learner may be required to transform previous beliefs. This process is called accommodation. I would like to add a third "A" to this model—avoidance. Human beings also work to preserve and conserve their existing belief systems and ignore or dismiss the new information to avoid incorporating it into existing beliefs and values.

This means that new ideas are accepted as "more of the same" or "what I do already." This can be a direct assimilation of ideas that are actually not new. Sometimes there is overassimilation when the new ideas are reframed to become something familiar and can be accepted as already in place. Avoidance of new ideas can occur when the considering them is too big a change or if ideas just don't fit: As Duffy (2003) argued,

> If the individual cannot link the new information to an existing mental model, he or she may construct a mental model to

> understand the new information or discard the information as irrelevant, unimportant, or wrong. (p. 31)

The new learning that fosters innovation comes from active episodes of accommodation. Accommodation is hard work that is essential for conceptual change and, therefore, for new learning (Olsen & Bruner, 1997). Accommodation creates dissonance and disorder, and it requires sustained attention and energy. This is not just a cognitive process; it is also emotional because every piece of information gets evaluated for its bearing on the self and the potential effect on the learner's environment.

Living in dissonance and challenging "taken to be true" notions is hard work. People tend to strive for relative stability between their internal conceptions and new information and may even avoid conditions that disrupt the way they see the world. The challenge is to move beyond dissonance into productive learning. But what is it that compels people to live in the dissonance, experience the discomfort of not understanding something, and strive to integrate new knowledge, even when it requires serious adjustments to their prior beliefs? What motivates learning? Understanding how motivation works provides the key to keeping learning at the forefront and building patterns of learning that are automatic and last a lifetime.

Clearly, motivation to learn is more complicated than we thought. If learning is not primarily dependent on external rewards, what else influences it? And how does it work? According to motivational researchers, students are motivated by success and by competence. And they are influenced by their beliefs about what contributes to success. Students who believe that academic achievement is determined by fixed ability are more likely to work toward performance goals (i.e., grades) to please the teacher and appear competent. For these students, grades are the currency in school and the exchange value of the grades is more important than the learning. Unfortunately, that means that they tend to pick easy tasks and are less likely to persist once they encounter difficulty (Stipek cited in Shepard, 2000). Students who attribute academic success to their efforts are more likely to adopt learning goals, which means they are motivated by an increasing sense of mastery and by the desire to become competent. When people succeed or fail, they explain their success or failure to themselves in various ways: effort, ability, task factors, or luck. Only the first of these attributions is likely to promote adaptive motivational tendencies. The student can decide to try harder and be successful. The other explanations, ability, task difficulty, or luck, are all

out of the student's control. When students do not believe that they have control over their achievements, they are much less motivated to work in school The extent to which individuals see themselves as competent and capable has a dramatic effect on their willingness to attempt new learning. People consciously or unconsciously ask questions such as, How uncomfortable will it make me? For how long? If motivation to learn is something that can be influenced, educators need to take a long, hard look at what they believe inspires students to learn.

When people consistently fail, they lose their motivation to learn and go to great lengths to avoid the pain of failure, the possibility of public humiliation and additional confirmation of their incompetence. In essence, human beings deal with threat by downshifting, turning off, and resisting engagement.

Motivation also flags when someone succeeds too easily. There is no reason to continue to expend energy. Csikszentmihalyi (1990) explains that if a person has few skills and faces little challenge, they are apathetic, while if challenge is low but their skill level is higher, they are likely to experience boredom. When both levels of challenge and skill are high, they are in "flow." When people believe they are able to succeed, they are willing to try new and challenging tasks, even when they are difficult. Continuous learning therefore appears to depend on a combination of effort and obvious success. When students are in flow, as Csikszentmihalyi (1990) describes it, they are completely absorbed in the task and will work hard and unflaggingly toward a goal, no matter how hard the new learning might be. The motivation for learning comes from achieving mastery of a skill or body of knowledge and the initial passion can be the seed for higher levels of attainment.

On the other hand, if the work is boring and undemanding or if the risk of failure and embarrassment is too high, young people quickly fill the time with activities they find more compelling, often to the chagrin of the adults around them.

Biggs and Moore (1993) talked about four broad categories of motivation, all of which can influence learning. *Extrinsic* motivation comes from outside and is central to surface learning. With extrinsic motivation, the task is carried out because it provides positive or negative reinforcing consequences. *Social* motivation is related to the influence of the person who formed the motive (i.e., parent, peer, or teacher) and the nature of the process (modeling, conformity, or cooperation) that is used to engage the learner. *Achievement* motivation is what drives learning for passing a test or getting a job. It is surface

motivation, exemplified in actions such as rote learning, which may, nonetheless, produce academic success. *Intrinsic motivation* is internal and comes from a need to engage in learning for its own sake, with personal commitment.

For a long time, reinforcement and rewards have been considered as important motivators. When initial interest in a task is low, rewards can increase the likelihood of academic engagement and performance of tasks. However, there is an interesting paradox about the nature and power of rewards when the behavior is intrinsically interesting. Extrinsic rewards have the potential to undermine performance, especially when the behaviors are ones that people are likely to do in the absence of the reward because they are inherently interested. There is a danger that when people who are highly intrinsically motivated are faced with a heavy accountability system of extrinsic rewards, they lose some of the intrinsic motivation and replace it with reinforcement from the reward. It is then very hard to return the behavior to the category of "important to do without a reward," and the behavior is likely to be less prevalent, not more.

As you can see, learning is not the exclusive purview of the intellect. It is also deeply emotional. As Daniel Goleman (1995) describes in his book *Emotional Intelligence,* thinking and rationality are the engine of our choices but feelings and emotional intelligence help streamline decisions by eliminating some options and highlighting others. The complementarity of feeling and thought provides the balance to harmonize head and heart.

Because it involves something new and unknown, learning inevitably triggers a range of emotions. New learning often includes a risk of failure and the possibility of discomfort and disorientation, as the learner struggles to make sense of new ideas. As Goleman (1995) describes it, the body experiences an emotional hijacking, where surges in the limbic system capture the rest of the brain. This can result in a feeling of helplessness and a downshifting to self-protective behaviors. They can also trigger flow, where the individual is totally and unselfconsciously absorbed and engaged in the pleasure of the learning and the doing (Csikszentimihalyi, 1990). Needless to say, people learn more and sustain their interest in the learning more when they have experienced and are motivated by experiences of flow in their learning than when their learning is forced and the emotional response is fear and anxiety. This state of engagement is based on relaxed alertness, a combination of perceived safety and challenging learning experiences.

Learning Happens in Context

Learning doesn't take place in a vacuum and learners are never *tabula rasa* (blank slates). They are not containers to be filled; rather, their minds are whirling, spiraling, dancing—connecting and challenging everything that they encounter in their social and physical environment. This process begins in tiny infants and, as they grow, they create coherent and (for them) reasonable patterns of the world around them. These beliefs about what the world is like come very early from interaction with the family and the community. Early experiential knowledge forms the fabric of children's lives and is often very resistant to change. It is the "stuff" that life has taught them. Learners test the veracity of their beliefs and their ideas (and those of their community and culture) by comparing them to the beliefs and ideas held by the people and the culture around them. This testing process often involves books, media, teachers, parents, and experts. Social interactions, formal and informal, are important contributors to learning and to the beliefs that people hold. Vygotsky (1978) enhanced our understanding of learning as a social process. He argued that the capacity to learn from others is fundamental to human intelligence. Learning occurs through a process of participation in various cultural practices and shared learning activities, as well as a process of individual knowledge formation. Knowledge is created through dialogue or conversations that make presuppositions, ideas, beliefs, and feelings explicit and available for exploration. It is in these conversations that new ideas, tools, and practices are created, and the initial knowledge is either substantially enriched or transformed during the process (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004).

Learning in schools, in particular, takes place in a social context. The nature of this social milieu has a profound effect on how, why, and what learning occurs. Classroom and school settings can be more or less learning friendly. People may also learn in one context but fail to transfer their learning to different contexts. When a subject is taught in many different contexts, however, and includes examples demonstrating broad applicability of what is taught, there is more likelihood of people being able to abstract what is relevant and construct their knowledge to apply flexibly as the situation arises. Perhaps most important, the learning context can influence learners' motivation and identities. Teachers' values and beliefs influence the type of structure they create in the classroom and their responses to students.

Assumption: Learning is individual and social.

Children are astute observers of teachers and can identify differential treatment by them (Weinstein, 1998), frequently lowering the motivation of students who see themselves as less able. Children are continuously shaping, maintaining, and actively evolving their identities as they move from one classroom context to the next (Pollard & Filer, 1999). This means that students' sense of self as a learner can be enhanced or threatened by changes over time in their relationships, structural position in the classroom, and relative success or failure. It can also be affected by their teachers' expectations, learning and teaching strategies, classroom organization, and as you will soon see, by assessment and evaluation practices.

Ideas for Follow Up

1. Use Figure 4.1 as an organizer for a mind map activity in which you identify things that you do (or could do) in your classroom assessment activities to capitalize on the human qualities identified by Costa (1996).

2. Think of something you remember learning that is now automatic for you (e.g., a sport, driving a car). What was it like when you were learning it? What helped you get good at it?